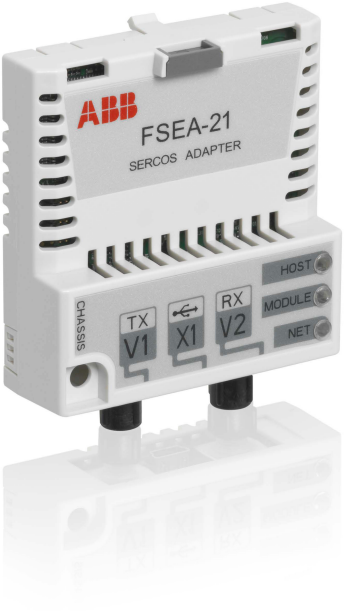
Options for ABB drives, converters and inverters

User's manual
FSEA-21 sercos II adapter module



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List of related manuals

	Code (EN/Multilingual)
Drive manuals and guides	
ACSM1 manuals	*00578051*
Option manuals and guides	
FSEA-21 sercos II adapter module user's manual	*3AUA0000068941*

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User’s manual

FSEA-21 sercos II adapter module

3AUA0000068941 Rev B
EN
EFFECTIVE: 2013-11-19

Table of contents

6. Start-up

7. Communication profiles

8. Communication protocol

9. Diagnostics

1

Safety

Contents of this chapter

The chapter contains the warning symbols used in this manual and the safety instructions which you must obey when you install or connect an optional module to a drive, converter or inverter. If you ignore the safety instructions, injury, death or damage can occur. Read this chapter before you start the installation.

Use of warnings

Warnings tell you about conditions which can cause injury or death, or damage to the equipment. They also tell you how to prevent the danger. The manual uses these warning symbols:

Electricity warning tells you about hazards from electricity which can cause injury or death, or damage to the equipment.

General warning tells you about conditions, other than those caused by electricity, which can cause injury or death, or damage to the equipment.

Safety in installation

These warnings are intended for all who install or connect an optional module into a drive, converter or inverter, and need to open its front cover or door to perform the work.

WARNING! Obey these instructions. If you ignore them, injury or death, or damage to the equipment can occur.

- If you are not a qualified electrician, do not do installation or maintenance work.
- Disconnect the drive, converter or inverter from all possible power sources. After you have disconnected the drive, converter or inverter, always wait for 5 minutes to let the intermediate circuit capacitors discharge before you continue.
- Disconnect all dangerous voltages connected to any control signal connectors in reach. For example, it is possible that 230 V AC is connected from outside to a relay output of the drive, converter or inverter.
- Always use a multimeter to make sure that there are no parts under voltage in reach. The impedance of the multimeter must be at least 1 Mohm.

2

Introduction to the manual

Contents of this chapter

This chapter introduces this manual.

Applicability

This manual applies to the FSEA-21 sercos II adapter module, SW version OFCS0125.

Compatibility

The FSEA-21 adapter module is compatible with the ACSM1 motion control program.

Target audience

This manual is intended for people who plan the installation, install, start up, use and service the adapter module. Before you do work on the adapter module, read this manual and the applicable drive/converter/inverter manual that contains the hardware and safety instructions for the product in question.

You are expected to know the fundamentals of electricity, wiring, electrical components and electrical schematic symbols.

The manual is written for readers worldwide. Both SI and imperial units are shown.

Contents

The manual consists of the following chapters:

- *Safety* presents the safety instructions which you must follow when installing a fieldbus adapter module.
- *Introduction to the manual* introduces this manual.
- *Overview of the sercos network and the FSEA-21 adapter module* contains a short description of the sercos network and the adapter module.
- *Mechanical installation* contains a delivery checklist and instructions on mounting the adapter module.
- *Electrical installation* contains general cabling instructions and instructions on connecting the adapter module to the sercos network.
- *Start-up* presents the steps to take during the start-up of the drive with the adapter module and gives examples of configuring the master system.
- *Communication profiles* describes the communication profiles used in the communication between the sercos network, the adapter module and the drive.
- *Communication protocol* describes the communication on a sercos network.
- *Diagnostics* explains how to trace faults with the status LEDs on the adapter module.
- *Technical data* contains the technical data of the adapter module and the sercos link.
- *Appendix A – USB interface* contains instructions on how to read and write the sercos IDNs of the adapter module directly with the DriveStudio PC tool software in installations where sercos IDNs cannot be accessed through the sercos master.
- *Appendix B – Time offset adjustment* contains information on the time offset adjustment feature of the adapter module.

- *Appendix C – sercos IDNs* contains a list of all sercos IDNs supported by the adapter module, and the attributes and descriptions of these IDNs.

Terms and abbreviations

General terms

Term	Explanation
Communication module	Communication module is a name for a device (eg, a fieldbus adapter) through which the drive is connected to an external communication network (eg, a fieldbus). The communication with the module is activated with a drive parameter.
Command word	See Control word.
COM port	IBM PC -compatible serial port interface created virtually on a PC by the built-in USB-to-serial adapter of the adapter module
Control word	16-bit or 32-bit word from master to slave with bit-coded control signals (sometimes called the Command word)
FSEA-21 sercos II adapter module	One of the optional fieldbus adapter modules available for ABB drives. The FSEA-21 is a device through which an ABB drive is connected to a sercos ring.
Parameter	Operating instruction for the drive. Parameters can be read and programmed with the drive control panel, drive PC tools or through the adapter module.
Profile	Adaptation of the protocol for certain application field, for example, drives. In this manual, drive-internal profiles (eg, DCU or FBA) are called native profiles.
Status word	16-bit or 32-bit word from slave to master with bit-coded status messages

sercos

Term	Explanation
Attenuation	Fact that the optical power at the receiver is less than at the transmitter
Broadcast	Transmission to all devices in a network without any acknowledgment by the receivers
Communication cycle	Accumulation of all telegrams between two master synchronization telegrams
Cycle time	Time span between two consecutive cyclically recurring events
Cyclic communication	Periodic exchange of telegrams
Cyclic data	Part of the telegram which does not change its meaning during cyclic operation of the interface
Cyclic operation	Devices in the communication network are addressed and queried one after the other at fixed, constant time intervals
Drive enable	Command that allows the power stage to be activated
Drive on	Command to start the drive
Drive (amplifier) telegram (AT)	Telegram sent by the drive (slave)
Identification number (IDN)	Designation of operating data under which a data block is preserved with its attribute, name, unit, minimum and maximum input values, and the data
Machine zero point	Machine-related point (in each axis) to which all position data are referred
Master data telegram (MDT)	Telegram transmitted by the master sending data to the slave(s) in a single ring
Master synchronization telegram (MST)	Telegram transmitted by the master, which sends a time synchronization signal to the slave(s) in a single ring
Master	Station which assigns the other stations in the ring (ie, slaves) the right to transmit
Non-cyclic transmission	Non-periodic exchange of data at the request of the master

Term	Explanation
Operating cycle	Period of the control loop within the drive or the control unit
Protocol	Convention about the data formats, time sequences, and error correction in the data exchange of communication systems
Reference point	Feedback-system -related point (in each axis) to which the feedback and command values are referred to after a homing procedure
Repeater function	Telegram that has been received is passed on reclocked and logically unchanged to the next station on the ring.
Ring structure	Network topology in which the transmission medium is routed from station to station in the form of a ring. The information is transmitted only in one direction.
Scaling data	Data which determines the weight of the transferred operation data
sercos interface	Serial real-time communication system interface
Slave	Device in the ring which is assigned the right to transmit by the master
Topology	Physical network architecture with respect to the connection between the stations of the communication system
Transmission medium	Collective term for the real form of the physical connection between the stations of a communication network (eg, fiber optic cable)

General abbreviations

Abbreviation	Explanation
DCU	Drive Control Unit
EHCI	Enhanced Host Controller Interface
FBA	Field Bus Adapter
F-SMA	Fiber Optic Subminiature Version A
HCS	Hard clad silica (glass fiber)
IEC	International Electrotechnical Commission
LSB	Least significant bit
MSB	Most significant bit
OHCI	Open Host Controller Interface
PID	Proportional / Integral / Derivative
POF	Polymer optic fiber (plastic fiber)
UHCI	Universal Host Controller Interface

sercos abbreviations

Abbreviation	Explanation
AT	Drive (amplifier) telegram
C1D C2D C3D	Class 1 diagnostic Class 2 diagnostic Class 3 diagnostic
CP	Communication phase
IDN	Identification number
IPOSYNC	Synchronization for drive interpolator
K_V (K_V-factor)	Gain of the position loop regulator
MDT	Master data telegram
MST	Master sync telegram
n	Velocity
n_{min}	Shut-off velocity in the drive after a C1D error

Abbreviation	Explanation
n_x	Velocity threshold
NC	Numerical control (also control unit or controller)
P	Power
P_x	Power threshold
T	Torque
T_f	Additive torque command value (feed forward)
T_{limit}	Limit value for the torque
T_x	Threshold torque
t_3	Command value valid time
t_4	Feedback acquisition capture point
t_{Ncyc}	Control unit cycle time
t_{Rcyc}	Drive control loop cycle time
t_{Scyc}	Communication cycle time
v	Velocity feedback value
v_1	Velocity feedback value of drive 1
v_f	Additive velocity command value (feed forward)
x	Position feedback value
x_1	Position feedback value of drive 1
x_1^*	Position command value of drive 1
x_m^*	Position command value of drive XX with data record m

Further information is available on the Internet from www.sercos.de and www.sercos.org.

3

Overview of the sercos network and the FSEA-21 adapter module

Contents of this chapter

This chapter contains a short description of the sercos network and the FSEA-21 adapter module.

sercos network

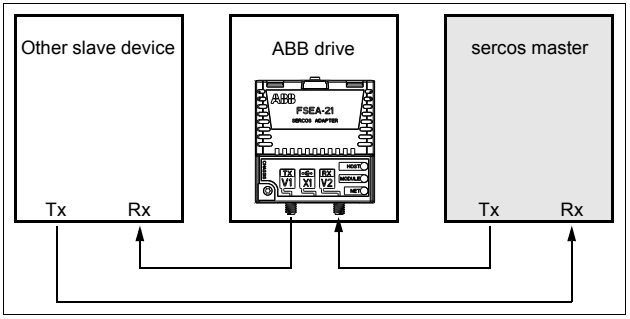
The sercos interface is a real-time industrial fieldbus specified in the IEC 61491 standard. sercos is an optical network and it uses plastic (1 mm) or glass (0.23 mm) optical fiber and F-SMA (IEC 60874-2) connectors as the transfer medium.

Optical fiber links form a ring topology, where communication is performed in cycles. The master defines a time-slot for each slave when they are allowed to transmit, at all other times slaves function as repeaters. The communication is initialized in phases from 0 to 4.

The master also defines the exact moments of time for reading the encoder position and delivering the reference value to the drive. The sercos interface provides and requires very small jitter performance at the range of a few microseconds.

Example topology of the sercos link

An example of an allowable topology is shown below.



FSEA-21 adapter module

The FSEA-21 adapter module is an optional device for ABB drives which enables the connection of the drive to a sercos network.

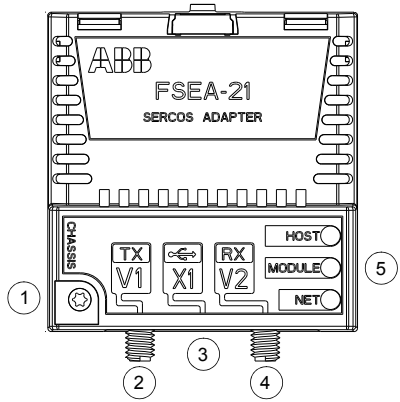
Through the adapter module you can:

- give control commands to the drive (for example, Start, Stop, Run enable)
- feed a motor speed, torque or position reference to the drive
- give a process actual value or a process reference to the PID controller of the drive
- read status information and actual values from the drive
- change drive parameter values
- reset a drive fault.

The sercos commands and services supported by the adapter module are discussed in chapter *Communication protocol*. Refer to the user documentation of the drive as to which commands are supported by the drive.

The adapter module is installed into an option slot on the control unit of the drive. See the drive manuals for module placement options.

Layout of the adapter module



1	Mounting screw
2	Transmitter optical output
3	USB connector
4	Receiver optical input
5	Diagnostic LEDs (see chapter *Diagnostics*)

4

Mechanical installation

Contents of this chapter

This chapter contains a delivery checklist and instructions on mounting the adapter module.

Unpacking and examining the delivery

1. Open the option package.
2. Make sure that the package contains:
   - sercos adapter module, type FSEA-21
   - this manual.
3. Make sure that there are no signs of damage.

Installing the adapter module

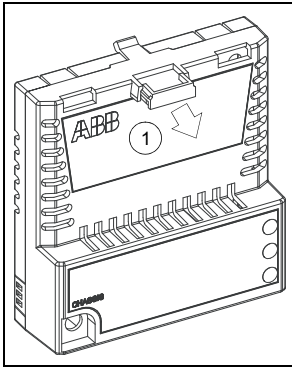
WARNING! Obey the safety instructions. See chapter *Safety* on page *9*. If you ignore the safety instructions injury or death can occur.

The adapter module is inserted into its specific position in the drive. The adapter module is held in place with plastic pins and one screw. The screw also provides the electrical connection between the adapter module and drive frame for cable shield termination.

When the adapter module is installed, the signal and power connection to the drive is made through a 20-pin connector.

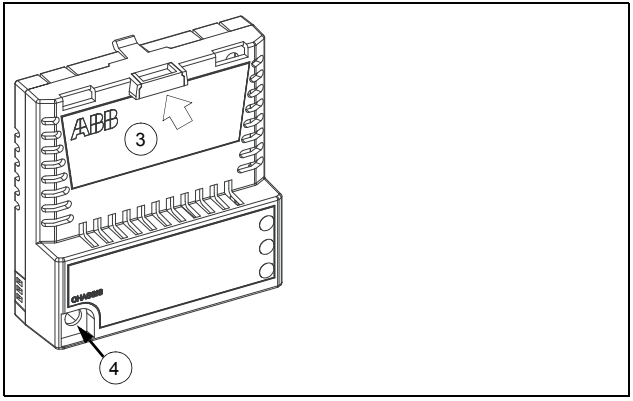
When you install or remove the adapter module from a control unit:

1. Pull out the lock.



2. Insert the adapter module carefully into its position on the drive.

3. Push in the lock.



4. Tighten the screw.

Note: It is essential to install the screw properly to fulfill the EMC requirements and to ensure the proper operation of the adapter module.

See the appropriate drive manual for instructions on how to install the adapter module to the drive.

5

Electrical installation

Contents of this chapter

This chapter contains:

- general cabling instructions
- instructions on connecting the adapter module to the sercos network.

Warnings

WARNING! Obey the safety instructions. See chapter *Safety* on page *9*. If you ignore the safety instructions, injury or death can occur. If you are not a qualified electrician, do not do electrical work.

General cabling instructions

- Route the bus cables as far away from the motor cables as possible.
- Avoid parallel runs.
- Use bushings at cable entries.

When you connect the network cables, carefully insert the cable so that the plug enters the jack straightly without any misalignment and without applying any twisting or bending moments to the cable or the plug. Do not use excessive force. Make sure that the plug latches into place and finally check that the plug has entered all the way into the jack.

Route the cables so that they do not transmit bending stress to the connector.

The drive must be installed so that there is enough room (15 cm) for the network cables so that the cables can be easily connected and disconnected and the cables need not go through an unreasonably small bending radius.

Connecting the FSEA-21 to the sercos network

The connectors used for sercos fiber optic cables should be F-SMA type with quality level 5 or greater and have a metallic outer ring. It is also recommended that the connectors have a strain relief to protect the cable.

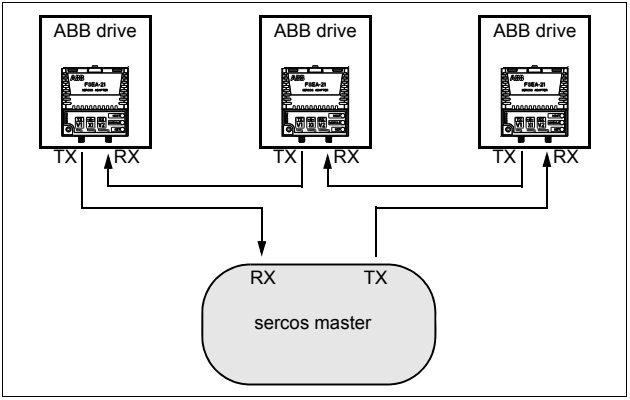
Two types of fiber cables are available for sercos networks: plastic optical fiber (POF) and hard clad glass silica (HCS) fiber cables. The fiber optic cables require special care during installation to ensure reliable operation. Cable manufacturer's guidelines on bend radius, twisting and tensile loads, squeezing and pinching must be followed.

General advice on fiber optic cable handling:

- Avoid a small bending radius and sharp corners.
- Do not twist, squeeze or pinch the fibers.
- Protect the connectors from impurities and scratching.

ABB can only guarantee correct and reliable operation of the adapter module if all other equipment installed on the sercos

network has been approved by sercos international and suitable fiber optic cables and connectors are used.



Connection procedure

1. Connect an optical fiber from the TX connector of the previous slave or the master (if this adapter module is the first slave on the ring) to RX connector (V2) of the adapter module.
2. Fasten the tightening nuts.
3. Connect another optical fiber from the TX connector (V1) of the adapter module to the RX connector of the next slave on the ring or the master (if this module is the last slave on the ring).
4. Fasten the tightening nuts.

Cable attenuation

Modern optical fiber cables have attenuation of approximately 200…300 dB/km for POF and 7…10 dB/km for HCS at wavelength of 650 nm. Especially when using POF cabling, the connection length dramatically affects transmission power margins. Because of over-drive limitations, too high transmission power is not acceptable either.

sercos does not specify any automatic transmission power adjustment. Therefore, adjust the transmission power to roughly match the length of the cable installed to the transmitter of the adapter module. The adapter module provides four choices for the transmission power which can be adjusted by a drive parameter (par. 51.04 in the ACSM1). See parameter *04 TX POWER*.

A small bending radius increases attenuation. For example, a 90-degrees corner with a radius of 15 mm on a 1 mm POF cable may increase attenuation roughly 0.4 dB. Poorly installed fiber connectors or impurities also add attenuation.

6

Start-up

Contents of this chapter

This chapter contains:

- information on configuring the drive for operation with the adapter module
- drive-specific instructions on starting up the drive with the adapter module
- examples of configuring the master station for communication with the adapter module.

Warnings

WARNING! Obey the safety instructions given in this manual and the drive documentation.

Drive configuration

The following information applies only to ACSM1 drives.

sercos connection configuration

After the adapter module has been mechanically and electrically installed according to the instructions in chapters *Mechanical installation* and *Electrical installation*, the drive must be prepared for communication with the module.

The detailed procedure of activating the module for sercos communication with the drive depends on the drive type. Normally, a parameter must be adjusted to activate the communication. See section *Required drive parameter configuration for ACSM1 drives*.

Once communication between the drive and the adapter module has been established, several configuration parameters are copied to the drive. These parameters are shown in the tables below and must be checked first and adjusted where necessary.

Note: To help you identify the parameters in the ACSM1, the names displayed by the drive are given in grey boxes in the tables.

In addition to the essential communication settings of the sercos ring, some of the sercos IDNs are also stored in the same parameter group so that they can be configured through the drive parameter interface. Other sercos IDNs can be changed and monitored via the sercos master or through the USB interface by using the DriveStudio software.

Note: The new settings take effect only when the adapter module is powered up the next time or when the fieldbus adapter refresh parameter is activated. In the ACSM1, the parameters are refreshed by parameter setting 51.27 FBA PAR REFRESH = REFRESH.

Note: Parameter settings take effect when the corresponding data is used the next time. For example, sercos address and bit rate settings take effect when the sercos interface is re-initialized.

FSEA-21 configuration parameters – group A (group 1)

Group A (group 1) corresponds to parameter group 51 in the ACSM1.

No.	Name/Value	Description	Default
01	FBA TYPE	**Read-only.** Shows the fieldbus adapter type as detected by the drive. Value cannot be adjusted by the user. If the value is 0 = None, the communication between the drive and the module has not been established.	**1** = SERCOS
02	SERCOS ADDRESS **ACSM1:** FBA PAR2	Selects the drive address of the adapter module. Address 0 causes the module to act as a passive repeater only. Each slave in a ring must have a unique address. Content of this parameter is also visible at IDN *P-0-0002*.	0
	0	Slave disabled	
	1…254	Drive address	
03	SERCOS BITRATE **ACSM1:** FBA PAR3	Selects the bit rate for the sercos interface. Must be the same on every node on a ring. Content of this parameter is also visible at IDN *P-0-0003*.	2
	2	2 Mbit/s	
	4	4 Mbit/s	
	8	8 Mbit/s	
04	TX POWER **ACSM1:** FBA PAR4	Adjusts the transmission power level to roughly match the length of the cable connected to the optical transmitter of the adapter module. If the NET LED (see *LEDs*) indicates distortion in the received signal, adjust the transmit power level of the previous slave. Content of this parameter is also visible at IDN *P-0-0004*.	1
	1	Lowest level, 0…15 m	
	2	Lower intermediate level, 15…30 m	
	3	Higher intermediate level, 30…45 m	
	4	Highest level, > 45 m	

No.	Name/Value	Description	Default
05	PROFILE **ACSM1:** FBA PAR5	Selects the communication profile used by the adapter module. **Note:** If mode 1 is selected, the operation is not compliant with the sercos specification. Content of this parameter is also visible at IDN *P-0-0005*. For more information on the communication profiles, see chapter *Communication profiles*.	0
	0	sercos	
	1	Transparent	
06	DRIVE SYNC POS **ACSM1:** FBA PAR6	Selects the point of the sercos cycle, where the drive software is synchronized to. sercos master determines two time instants within the communication cycle, called t_3 and t_4. Definitions: t_3 = command value valid time (the time at which the drive is allowed to access the new command values after reception of the MDT). t_4 = feedback acquisition capture time (the sampling point of the feedback, eg, axis actual position). With the ACSM1, only one of these timing requirements can be obeyed at a time. t_3 sync means that the reference value is delivered to the drive exactly at the correct time, but feedback acquisition time may not match the time specified by the master. t_4 sync means that feedback acquisition takes place exactly at the correct time but the reference values may be taken into use in the drive at a different time than that specified by the master. Content of this parameter is also visible at IDN *P-0-0006*.	3
	0	No synchronization	
	3	Synchronization to t_3 point of the sercos cycle	
	4	Synchronization to t_4 point of the sercos cycle	

No.	Name/Value	Description	Default
07	REF SEND TIME **ACSM1:** FBA PAR7	sercos time parameters normally determine when the module sends the reference to the drive to meet the timing requirements set forth by the master. However, there are applications where the reference values should be taken into use in the drive as soon as possible, ignoring all the other, possibly slower, drives on the same ring. Selects whether command values are sent to the drive at the time specified by the timing calculation performed by the module to obtain correct drive performance in relation to the selected synchronization mode, or whether they are sent immediately after the MDT – as soon as command values are in the IDN database of the module. **Note:** If mode 1 is selected, the operation is not compliant with the sercos specification. Content of this parameter is also visible at IDN *P-0-0007*.	0
	0	Normal mode (sercos compliant)	
	1	Immediate (reference sent to the drive as soon as MDT data is received)	
08	CP4 TRANSITION MODE **ACSM1:** FBA PAR8	Selects whether to allow switch to CP4 if there are errors in CP4 transition check. Normally the IDN 00128 CP4 transition check fails if there are any errors in the checked IDNs. When mode 1 is selected, the procedure command IDN 00128 CP4 transition check is always properly executed. However if any item in the check fails (ie, the transition check would have failed in the normal mode), then IDN 00129 MC1D bit 15 is set to prevent from starting the drive. Motivation for this feature is compatibility with some non-standard installations in the industry that require transition to CP4 in all circumstances. **Note:** If mode 1 is selected, the operation is not compliant with the sercos specification. Content of this parameter is also visible at IDN *P-0-0008*.	0
	0	Normal (sercos compliant)	
	1	Ignore errors in the CP4 transition check	

No.	Name/Value	Description	Default
09	ERASE FBA CONFIG **ACSM1:** FBA PAR9	IDN values saved into non-volatile memory of the adapter module can be erased by this parameter. **Note:** Some non-volatile IDNs are not stored in the adapter module, but their values are calculated from drive parameters. Erasure of the adapter module configuration does not erase those IDNs. After setting the parameter to 1, refresh drive parameters to erase the module configuration. Automatically set back to 0 after erasing the module configuration.	0
	0	No operation	
	1	Erase configuration data from the module	
10	Primary operation mode **ACSM1:** FBA PAR10	Value for IDN*S-0-0032* can also be set by this drive parameter. See *Supported modes of operation*.	0
	IDN S-0-0032 Primary operation mode		
11	Position data scaling type **ACSM1:** FBA PAR11	Value for IDN *S-0-0076* can also be set by this drive parameter. See *Position control operation mode*.	2
	IDN S-0-0076 Position data scaling type		

No.	Name/Value	Description	Default
12	Rotational position resolution (MSB) **ACSM1:** FBA PAR12	Value for IDN *S-0-0079* can also be set by drive parameters Rotational position resolution (MSB) and Rotational position resolution (LSB). For description of this IDN, see the entry in *Appendix C – sercos IDNs*. Since these two parameters hold only 16 bits each, 32 bit IDN 00079 must be given in two parts. Parameter 12 holds bits 31…16 and parameter 13 holds bits 15…0 of IDN 00079. **Example:** Par. 12 = 54 and par. 13 = 61056. Rotational position resolution = 54 * 65536 + 61056 = 3600000. Likewise, calculate the parameter values for Rotational position resolution value of 3 600 000 as follows: Par. 12 = INT(3600000 / 65536) = 54. Par. 13 = MOD (3600000 ; 65536) = 61056. **Note:** This applies only when accessing IDN 00079 via the drive parameters. When accessing the IDN via the sercos interface or the USB interface, no calculations are required.	54[1)]
	31…16	Bits of IDN S-0-0079 Rotational position resolution	
13	Rotational position resolution (LSB) **ACSM1:** FBA PAR13	See the description above.	61056[1)]
	15…0	Bits of IDN S-0-0079 Rotational position resolution	

No.	Name/Value	Description	Default
14	Reference offset (MSB) **ACSM1:** FBA PAR14	Value for IDN *S-0-0150* can also be set by drive parameters Reference offset (MSB) and Reference offset (LSB). For description of this IDN, see the entry in *Appendix C – sercos IDNs*. Since these two parameters hold only 16 bits each, 32 bit IDN 00150 must be given in two parts. Parameter 14 holds bits 31…16 and parameter 15 holds bits 15…0 of IDN 00150. Furthermore, IDN 00150 is a 2's complement signed integer, whereas the two parameters are displayed as unsigned integers. **Example:** parameter 14 = 23 and parameter 15 = 52612. Reference offset 1 = 23 * 65536 + 52612 = 1559940. Calculate the parameter values for positive Reference offset 1 value of 1 559 940 as follows: Par.14 = INT (1559940 / 65536) = 23. Par.15 = MOD (1559940 ; 65536) = 52612. As said, IDN 00150 can also have negative values, its range being $-2^{31}…2^{31} - 1$. When converting an unsigned integer which represents a negative value, 2^{32} must be subtracted from it. Likewise, before splitting up negative values, 2^{32} must be added to the negative value. When the value of parameter 14 is equal to or greater than 32768, the resulting IDN 00150 value is negative. **Example:** Par.14 = 65512 and par.15 = 12924. Reference offset 1 = 65512 * 65536 + 12924 - 2^{32} = -1559940. Calculate the parameter values for negative Reference offset 1 value of -1559940 as follows: First, add 2^{32}, ie: -1559940 + 2^{32} = 4293407356. Then: par. 14 = INT (4293407356 / 65536) = 65512. Par. 15 = MOD (4293407356 ; 65536) = 12924. **Note:** This applies only when accessing IDN 00150 via the drive parameters. When accessing the IDN via the sercos interface or the USB interface, no calculations are required.	0
	31…16	Bits of IDN S-0-0150 Reference offset 1	

No.	Name/Value	Description	Default
15	Reference offset (LSB) **ACSM1:** FBA PAR15	See the description above.	0
	15…0	Bits of IDN S-0-0150 Reference offset 1	
16	Homing acceleration (MSB) **ACSM1:** FBA PAR16	Value for IDN *S-0-0042* can also be set by drive parameters Homing acceleration (MSB) and Homing acceleration (LSB). For a description of this IDN, see the entry in *Appendix C – sercos IDNs*. Since these two parameters hold only 16 bits each, 32 bit IDN 00150 must be given in two parts. Parameter 14 holds bits 31…16 and parameter 15 holds bits 15…0 of IDN 00150. Furthermore, IDN 00150 is a 2's complement signed integer, whereas the two parameters are displayed as unsigned integers. If the combined value is zero or negative, then the value of IDN 00138 Bipolar acceleration limit value is used also for IDN 00042.	0
	31…16	Bits of IDN S-0-0042 Homing acceleration	
17	Homing acceleration (LSB) **ACSM1:** FBA PAR17	Value for IDN *S-0-0042* can also be set by drive parameters Homing acceleration (MSB) and Homing acceleration (LSB). For description of this IDN, see the entry in *Appendix C – sercos IDNs*. Since these two parameters hold only 16 bits each, 32 bit IDN 00150 must be given in two parts. Parameter 14 holds bits 31…16 and parameter 15 holds bits 15…0 of IDN 00150. Furthermore, IDN 00150 is a 2's complement signed integer, whereas the two parameters are displayed as unsigned integers. If the combined value is zero or negative, then the value of IDN 00138 Bipolar acceleration limit value is used also for IDN 00042.	0
	15…0	Bits of IDN S-0-0042 Homing acceleration	
18 … 19	Reserved	Not used by the adapter module.	N/A

No.	Name/Value	Description	Default
20	ACT position time displacement **ACSM1:** FBA PAR20	Value for IDN *P-0-0020* can also be set by this drive parameter. For a description of this IDN, see *Appendix B – Time offset adjustment*. IDN is a 16 bit two's complement signed integer. Range of a 16 bit signed integer is -32768…32767. Drive parameter is displayed as an unsigned integer, with negative values displayed as large positive values (≥ 32768). To calculate the drive parameter value for a negative time displacement value, add 2^{16} (= 65536) to the desired negative value. **Example:** To calculate the parameter value for negative ACT position time displacement value of -450, add 2^{16}, ie,: -450 + 65536 = 65086. Valid only when setting a negative value. **Note:** The above is true only when setting IDN P-0-0020 via this drive parameter. When accessing the IDN via the sercos interface or the USB interface, no calculations are required.	0
	-2000…32767	IDN P-0-0020 ACT position time displacement (µs)	
21	REF position time displacement **ACSM1:** FBA PAR21	Value for IDN *P-0-0021* can also be set by this drive parameter. For description of this IDN, see *Appendix B – Time offset adjustment*.I IDN is a 16 bit two's complement signed integer. Range of a 16 bit signed integer is -32768…32767. Drive parameter is displayed as an unsigned integer, with negative values displayed as large positive values (≥ 32768). To calculate the drive parameter value for a negative time displacement value, add 2^{16} (= 65536) to the desired negative value. **Example:** To calculate the parameter value for negative REF position time displacement value of -450, add 2^{16}, ie,: -450 + 65536 = 65086. Valid only when setting a negative value. **Note:** The above is true only when setting IDN P-0-0021 via this drive parameter. When accessing the IDN via the sercos interface or the USB interface, no calculations are required.	0
	-2000…t_{Scyc}	IDN P-0-0021 REF position time displacement (µs)	

No.	Name/Value	Description	Default
22	DRIVE POS CTL MODE **ACSM1:** FBA PAR22	Selects the ACSM1 control mode to be used in the position control operation mode. For information on ACSM1 control modes, see the ACSM1 drive documentation. Content of this parameter is also visible in IDN *P-0-0022*.	0
	0	Position control	
	1	Synchron control	
23 … 24	Reserved	Not used by the adapter module.	N/A
25	REINIT SERCOS **ACSM1:** FBA PAR25	Can be used to force the re-initialization of the sercos interface. After setting the parameter to 1, refresh drive parameters to re-initialize the sercos interface.	0
	0	No operation	
	1	Re-initialize sercos interface	
26	Reserved	Not used by the adapter module.	N/A
27	FBA PAR REFRESH **ACSM1:** FBA PAR REFRESH	Validates any changed adapter module configuration parameter settings. After refreshing, the value reverts automatically to **0** = Done. **Note:** This parameter cannot be changed while the drive is running.	**0** = Done
	0 = Done	Refreshing done	
	1 = Refresh/Configure	Refreshing	

No.	Name/Value	Description	Default
28	PAR TABLE VER **ACSM1:** PAR TABLE VER	Read-only. Displays the parameter table revision of the fieldbus adapter module mapping file stored in the memory of the drive. In format **xyz**, where **x** = major revision number **y** = minor revision number **z** = correction number OR in format **axyz**, where **a** = major revision number **xy** = minor revision numbers **z** = correction number or letter.	N/A
	0x0000…0xFFFF	Parameter table revision	
29	DRIVE TYPE CODE **ACSM1:** DRIVE TYPE CODE	Read-only. Displays the drive type code of the fieldbus adapter module mapping file stored in the memory of the drive.	N/A
	0…65535	Drive type code of the fieldbus adapter module mapping file	
30	MAPPING FILE VER **ACSM1:** MAPPING FILE VER	Read-only. Displays the fieldbus adapter module mapping file revision stored in the memory of the drive in decimal format. Example: 0x107 = revision 1.07.	N/A
	0…65535	Mapping file revision	

No.	Name/Value	Description	Default
31	D2FBA COMM STA **ACSM1:** D2FBA COMM STA	Read-only. Displays the status of the fieldbus adapter module communication. **Note:** The value names may vary by drive.	**0** = Idle
	0 = Idle	Adapter is not configured.	
	1 = Exec.init	Adapter is initializing.	
	2 = Time out	Time-out has occurred in the communication between the adapter and the drive.	
	3 = Conf.err	Adapter configuration error: Major or minor revision code of the common program revision in the fieldbus adapter module is not the revision required by the module or mapping file upload has failed more than three times.	
	4 = Off-line	Adapter is off-line.	
	5 = On-line	Adapter is on-line.	
	6 = Reset	Adapter is performing a hardware reset.	
32	FBA COMM SW VER **ACSM1:** FBA COMM SW VER	Read-only. Displays the common program revision of the adapter module in format **axyz**, where: **a** = major revision number **xy** = minor revision numbers **z** = correction number or letter. Example: 190A = revision 1.90A	N/A
	0x0000…0xFFFF	Common program version of the adapter module	
33	FBA APPL SW VER **ACSM1:** FBA COMM APPL VER	Read-only. Displays the application program revision of the adapter module.	N/A
	0x0000…0xFFFF	Application program revision of the adapter module	

[1] The default value of Rotational position resolution is 0x0036EE80 = 3600000 (decimal).

Control locations

ABB drives can receive control information from multiple sources including digital inputs, analog inputs, the drive control panel and a communication module (for example, the adapter module). ABB drives allow the user to separately determine the source for each type of control information (Start, Stop, Direction, Reference, Fault reset, etc.).

To give the fieldbus master station the most complete control over the drive, the communication module must be selected as the source for this information. The parameter setting examples below contain the drive control parameters needed in the examples. For a complete parameter list, see the drive documentation.

Required drive parameter configuration for ACSM1 drives

Configure the drive to make it function properly with the adapter module. The required drive parameter settings for the ACSM1 series drives are listed below. Refer to the drive documentation for more information about these parameters.

General settings

Set the following ACSM1 parameters as instructed to ensure proper operation.

No.	Parameter name	Set to value
10.01	EXT1 START FUNC	FBA
24.01	SPEED REF1 SEL	FBA REF1
32.01	TORQ REF1 SEL	FBA REF1
34.01	EXT1/EXT2 SEL	C.False
34.02	EXT1 MODE1/2 SEL	C.False
50.01	FBA ENABLE	Enable
50.04	FBA REF1 MODESEL	Raw data, Torque, Speed or Position (see below)
50.05	FBA REF2 MODESEL	Raw data, Torque, Speed or Position (see below)
60.05	POS UNIT	Revolution
60.10	POS SPEED UNIT	u/s
65.01	POS REFSOURCE	Ref table

No.	Parameter name	Set to value
65.02	PROF SET SEL	C.False
65.03	POS START 1	P.2.12 FBA MAIN CW.25
65.04	POS REF 1	SEL FBA REF1
65.22	PROF VEL REF SEL	FBA REF1
67.01	SYNC REF SEL	FBA REF1
70.03	POS REF ENA	C.False

Drive-controlled homing procedure parameters

If the drive-controlled homing procedure is used, set the following parameters as shown below.

Note: The adapter module sets the value of parameter 62.01 according to IDN 00147 Homing parameter.

No.	Parameter name	Set to value
62.01	HOMING METHOD	3, 4, 5, 6, 17, 18, 19, 20, 21, 22, 33 or 34
62.02	HOMING START FUNC	Normal
62.03	HOMING START	P.2.12 FBA MAIN CW.26

Parameter for IDN S-0-0400 Home switch

If IDN 00400 Home switch is used by the master, the home switch digital input must be routed to the adapter module, as shown below.

No.	Parameter name	Set to value
50.11	FBA SW B15 SRC	P.6.11 POS CORR STATUS.10

Note: Despite the misleading name of parameter 50.11 FBA SW B15 SRC it selects the source for DCU SW bit 31. Bit 10 of parameter 6.11 POS CORR STATUS contains the status of the home switch digital input. The value for IDN 00400 is taken from DCU SW bit 31.

Parameters for drive synchronization

Set the following parameters for the drive synchronization.

No.	Parameter name	Set to value
57.09	KERNEL SYNC MODE	FBsync
57.10	KERNEL SYNC OFFS	-0.050 ms
51.06	FBA PAR6	3 or 4

Interpolator settings

The interpolator settings are applicable in the ACSM1 synchron control mode. The position reference in this control mode can be interpolated to achieve a smoother motion response. The interpolator cycle time should be set equal to the sercos cycle time.

No.	Parameter name	Set to value
67.03	INTERPOLAT MODE	INTERPOLATE
67.04	INTERPOLAT CYCLE	Set equal to sercos cycle time (ms)

Default drive control mode

The drive control mode is changed by the adapter module according to the operation mode requested by the sercos master. However, we recommend you to set par. 34.03 EXT1 CTRL MODE1 according to the primary operation mode.

Note: The value of parameter 34.03 EXT1 CTRL MODE1 does not change when the adapter module switches the drive control mode.

No.	Parameter name	Set to value
34.03	EXT1 CTRL MODE1	Speed, Torque, Position or Synchron

DCU ACT1 and ACT2 data sources

Select the feedbacks from the drive to the adapter module (torque, speed, position). Only the selected feedbacks are available to the sercos master. You can select only two out of the three at one time. We recommend you to select the speed and position feedbacks, unless torque feedback is required. The data sources are selected by the FBA REF1/2 MODESEL parameters, see below.

No.	Parameter name	Set to value
50.04	FBA REF1 MODESEL	Torque, Speed or Position
50.05	FBA REF2 MODESEL	Torque, Speed or Position

If the FBA REF1/2 MODESEL parameters are set to "Raw data", then the data sources are selected by the FBA ACT1/2 TR SRC parameters, see below.

No.	Parameter name	Set to value
50.06	FBA ACT1 TR SRC	P.1.06 TORQUE, P.1.01 SPEED ACT or P.1.12 POS ACT
50.07	FBA ACT2 TR SRC	P.1.06 TORQUE, P.1.01 SPEED ACT or P.1.12 POS ACT

Note: After changing parameter 50.06 or 50.07, the settings must be read into the adapter module with parameter 51.27 FBA PAR REFRESH.

Note: IDN 00013 Class 3 diagnostic, bit 3 "$T \geq T_x$" and bit 4 "$T \geq T_{limit}$" will not be operational unless torque feedback is available from the drive. The same also applies to any other IDN value or status bit etc. whose value depends on the feedback which is not available from the drive.

Position data resolution

The resolution of the position feedback and command data in the drive may be adjusted as follows.The position data size is always 32 bits total. Parameter 60.09 POS RESOLUTION determines the number of bits used for the fractional part. For example, with value 24, there are 8 bits for integral revolutions (-128…127) and 24 bits for the fractional part within the revolution.

No.	Parameter name	Set to value
60.09	POS RESOLUTION	10…24

Configuring the sercos master

After the adapter module has been initialized by the drive, the master station must be prepared for communication with the module. Due to the large number of different sercos masters, specific instructions cannot be provided here. A generic procedure for getting started with a sercos system and an example of Beckhoff TwinCAT System Manager are given below. If you are using another master system, refer to its documentation for more information.

1. Set the bit rate setting at the master and the adapter module to match each other (as well as all other stations in the ring).
2. Set the master optical transmitter power level so that the first slave in the ring receives the master's signal correctly.

   In the FSEA-21, the NET LED is red (without blinking or flickering) when the signal from the previous station is received without distortion.
3. Set the optical transmitter power of the last station in the ring so that the master receives its signal correctly.

   Now the master should be able to "close" the ring and enter communication phase 0 (CP0).
4. Configure the addresses of all slave stations in the ring to the master.

   Each slave station must have an unique address. Also, make sure that the adapter module address is not 0.

Now the master should be able to find all slave stations in the ring and enter CP1.

In CP1, the master checks that it can communicate to all stations in the ring. If everything is OK, the master can enter CP2.

In CP2, the master can read and write the IDNs of the slaves. At this stage the module can be configured and its settings saved. Usually the masters can be configured to set all necessary IDNs automatically each time when forming a ring, which is the better option. Configure the master for the desired cycle time and set desired telegram type and operation modes as well as data scaling and other such settings to the slaves.

When the timing of the sercos ring and telegram types have been correctly configured, the master can switch to CP3. If the CP3 transition is not successful, check the IDN-list IDN *00021* and IDN *00095* and solve invalid settings one by one.

In CP3, the master has switched to the operational cycle time and the timing of the ring has been verified. After all operational settings have been done, the master can switch to CP4. If the CP4 transition is not successful, check the IDN-list IDN *00022* and IDN *00095* and solve invalid settings one by one.

In CP4, the master can start and control the drives.

Configuring Beckhoff TwinCAT System Manager

This example shows how to get started with Beckhoff TwinCAT and the Beckhoff FC7501 PCI card as the sercos master. After the hardware and software installation has completed, start the TwinCAT system manager and do as follows:

1. Start a new System Manager session (**File –> New**).
2. Add the FC7501 PCI card to the I/O Devices list on the left pane by right-clicking **I/O Devices** and selecting **Append Device…**.
3. Expand the list **SERCOS interface** and select **SERCOS Master/Slave FC75xx, PCI**.

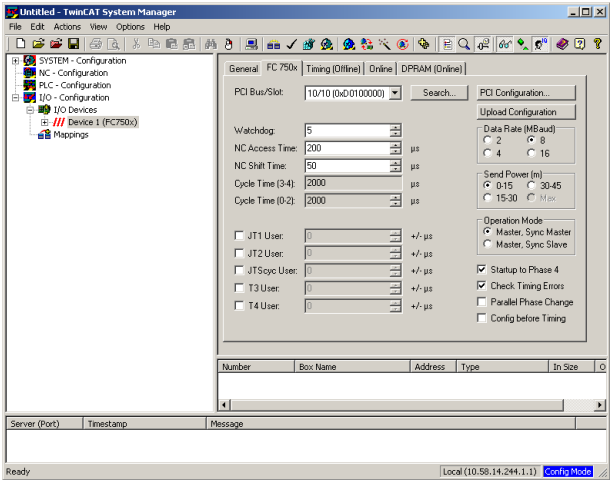
   Click **Ok**.

4. On the new device, eg, **Device 1 (FC75xx)**, select the **FC 75xx** tab and the correct bit rate for the ring in the **Data Rate (MBaud)** field.

   It must match the bit rate set on the adapter module.

5. Select an appropriate value on the **Send Power (m)** field.

   See the figure below.



6. Add the drive to the I/O device by right-clicking, eg, **Device 1 (FC75xx)** and selecting **Append Box…**.

7. Expand the **Miscellaneous** list and select **Drive Generic (SERCOS)**.

   Click **Ok**.

8. Select the new drive, eg, **Axis 1 (Sercos Drive)**.

9. On the **SERCOS Drive** tab, select the correct drive address matching the address set on the adapter module.

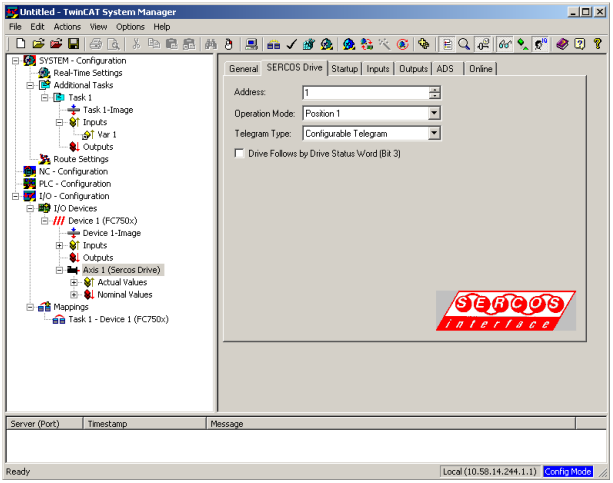
10. Select the operation mode according to the application.

    In this example, select the operation mode **Position 1**. See section *Supported modes of operation*.

11. Select the telegram type according to the application.

    In this example, the telegram type is **Configurable Telegram**. See section *Telegram types*.

    See the figure below.



12. On the **Startup** tab, click IDN **S-0-0076 Position data scaling type** and then **Edit…**.

13. Set value 2 on the **Value** field and click **Ok**.

    You have now selected rotational scaling, preferred scaling and absolute format for the Position data scaling type. The

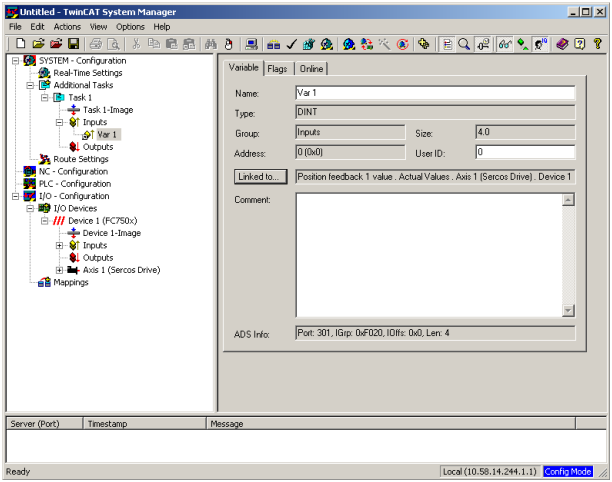
master will automatically make this setting when initializing the ring.

14. Change the **S-0-0044 Velocity data scaling type** value to 2 in the same way.
15. Verify that value 2 (0x0002) has been set to both IDN S-0-0044 and S-0-0076.
16. On the **Inputs** and **Outputs** tabs, verify that at least IDNs S-0-0051 and S-0-0047 have been selected to be transferred cyclically from the drive to the master (Inputs) and from the master to the drive (Outputs).
17. To determine the cycle time, map a variable to a task as follows:
    - Add a task by expanding the **SYSTEM - Configuration** list on the left pane.
    - Right-click **Additional Tasks** and select **Append Task…**.
    - Click **Ok** in the **Insert Task** dialog box.

    In the TwinCAT system, a task defines the cycle time, therefore at least one variable from the **Sercos Drive** axis must be mapped to a task.
18. On the **Task tab**, tick the **Auto start** check box when you have selected, eg, **Task 1**.

    Now you can adjust the cycle time with the **Cycle ticks** selection.
19. Select, eg, 2 ms cycle time.
20. On the left pane, right-click on **Inputs** under, eg, **Task 1** and select **Insert Variable…**.
21. Select Variable type **INT32** and click **Ok**.
22. To map the task variable to, eg, **Axis 1**, click the **Linked to…** button and select **Position feedback 1 value**.

Click **Ok**. See the figure below.



23. Select **Activate Configuration** from the Actions menu to start the sercos master.

    Click **Yes** and **Ok** in the dialog boxes to restart the TwinCAT System in Run Mode.

If errors occur, IDN values to be set in startup may be incorrect or not matching the drive configuration. The IDN values of the adapter module can be monitored on the **Online** tab of, eg, **Axis 1 (Sercos Drive)** when the master is in CP2, CP3 or CP4.

The current communication phase is visible on the **Online** tab of, eg, **Device 1 (FC75xx)**. In CP4, the master has control of the drive. The Status and Control words and other cyclic data can be monitored and controlled in the **Actual Values** and **Nominal Values** lists under, eg, **Axis 1 (Sercos Drive)**.

7

Communication profiles

Contents of this chapter

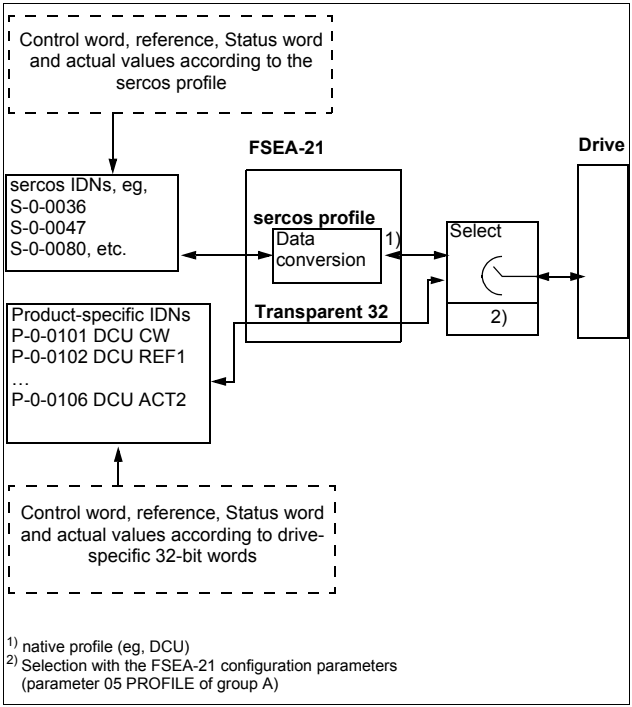
This chapter describes the communication profiles used in the communication between the sercos ring, the adapter module and the drive.

Communication profiles

Communication profiles are defined ways of conveying commands and status information, transported over some communication protocol, between the master station and the drive.

The adapter module provides two profile choices. The sercos profile is converted to the drive's native profile (eg, DCU) in the module, whereas in the transparent profile mode no data conversion takes place. Both profiles are transported over the sercos protocol.

The figure below illustrates the profile selection:



The following sections describe the Control word, the Status word, references and actual values for the sercos profile and transparent profile mode. See the drive manuals for details on the native communication profiles.

sercos communication profile

Telegram types

The telegram types supported by the adapter module are listed in the table below with their contents. The contents of the telegrams in telegram type 7 (Application telegram) are user configurable.

#	Name	MDT	AT
0	Standard telegram 0	-	-
1	Standard telegram 1	S-0-0080 Torque command	-
2	Standard telegram 2	S-0-0036 Velocity command	S-0-0040 Velocity feedback
3	Standard telegram 3	S-0-0036 Velocity command	S-0-0051 Position feedback
4	Standard telegram 4	S-0-0047 Position command	S-0-0051 Position feedback
5	Standard telegram 5	S-0-0047 Position command S-0-0036 Velocity command	S-0-0051 Position feedback S-0-0040 Velocity feedback
6	Standard telegram 6	S-0-0036 Velocity command	-
7	Application telegram	S-0-0036 Velocity command S-0-0037 Additive velocity cmd. S-0-0047 Position command S-0-0080 Torque command S-0-0081 Additive torque cmd. P-0-0101 DCU CW P-0-0102 DCU REF1 P-0-0103 DCU REF2	S-0-0040 Velocity feedback S-0-0051 Position feedback S-0-0084 Torque feedback S-0-0189 Following distance P-0-0104 DCU SW P-0-0105 DCU ACT1 P-0-0106 DCU ACT2

The telegram type is set into IDN 00015, see description below. The master usually handles bits above bit 2 automatically, and therefore you must only specify the telegram type number 0…7 (see the table above). The telegram type must be set in CP2. When telegram type 7 is selected, contents of the telegrams must be specified in CP2 to IDN 00016 and IDN 00024.

Note: Do not write into the IDNs P-0-0101 (32869) DCU CW, P-0-0102 (32870) DCU REF1 or P-0-0103 (32871) DCU REF2 when the sercos profile is selected. You may write into them when the transparent communication profile is selected.

IDN S-0-0015 Telegram type	
Bit	**Meaning**
15…12	Reserved
11…10	Length of the AT service channel
9…8	Length of the MDT service channel
7…3	Reserved
2…0	Telegram type (0…7)

Supported modes of operation

The adapter module supports the following operation modes.

Note: The different operation modes are available only with specified telegram types. The telegram type must be selected according to the operation modes to be used.

Mode	Name	Telegram types
0	No mode of operation	all
1	Torque control	1, 7
2	Velocity control	2, 3, 5, 6, 7
3	Position control, with following error	4, 5, 7
0xB	Position control, without following error	4, 5, 7
7	Operation mode without control loops	all

Note: No distinction is made between the position control operation modes. IDN S-0-0296 Velocity feed forward gain is

operational also in operation mode “position control, with following error”.

The operation modes are configured by bits 9…0 in the IDNs listed below. These IDNs can be set in CP2 and CP3.

IDN S-0-0032 Primary operation mode **IDN S-0-0033 Secondary operation mode 1** **IDN S-0-0034 Secondary operation mode 2** **IDN S-0-0035 Secondary operation mode 3**	
Bit	**Meaning**
15…10	Reserved
9…0	Operation mode

During operation, the operation mode (Primary operation mode, Secondary 1…3) is selected by the sercos Control word bits 11, 9, 8.

Torque control operation mode

In the torque control operation mode, the IDNs 00080 and 00081 are used to control the drive. The scaling of torque command and feedback data is determined by IDNs 00085, 00086, 00093 and 00094.

The IDN 00085 may be used to invert (change sign of) the torque command and feedback values.

IDN S-0-0085 Torque polarity parameter		
Bit	**Value**	**Description**
15…3	n/a	Reserved
2	0 1	No operation Invert torque feedback value
1	0 1	No operation Invert additive torque command value
0	0 1	No operation Invert torque command value

IDN 00086 determines the format of the torque data:

- Percentage scaling means that torque command and feedback data is expressed as percentage of the drive nominal torque with a scale of 0.1%. For example, value 123 = 12.3% torque.
- Rotational scaling means that command and feedback data is expressed as newton meters (Nm).
  - Preferred (default) scaling is 10^{-2} Nm, eg, value 1234 = 12.34 Nm.
  - When parameter scaling is selected, the scaling exponent may be changed (IDN 00094 Torque/force data scaling exponent).

The drive nominal torque value (Nm), which the module uses for rotational scaling, is visible at IDN P-0-0200 (32968) Nominal torque.

IDN S-0-0086 Torque/force data scaling type		
Bit	**Value**	**Meaning**
15…7	0	Reserved
6	0	Data reference at the motor shaft
5	0	Reserved
4	0	Unit = Nm
3	0 1	Preferred scaling Parameter scaling
2…0	000 010	Percentage scaling Rotational scaling

Velocity control operation mode

In the velocity control operation mode, the IDNs 00036 and 00037 are used to control the drive. The scaling of velocity command and feedback data is determined by IDNs 00043, 00044, 00045 and 00046.

The IDN 00043 may be used to invert (change sign of) the velocity command and feedback values:

IDN S-0-0043 Velocity polarity parameter		
Bit	**Value**	**Meaning**
15…3	n/a	Reserved
2	0 1	No operation Invert velocity feedback value
1	0 1	No operation Invert additive velocity command value
0	0 1	No operation Invert velocity command value

IDN 00044 determines the format of the velocity data:

- No scaling means that velocity command and feedback values are passed to and from the drive in raw form without any translation.
- Rotational scaling means that command and feedback data is expressed in rpm.
  - Preferred (default) scaling is 10^{-4} r/min, eg, value 123456 = 12.3456 r/min.
  - When parameter scaling is selected, the scaling exponent may be changed (IDN 00046 Velocity data scaling exponent).

IDN S-0-0044 Velocity data scaling type		
Bit	**Value**	**Meaning**
15…7	n/a	Reserved
6	0	Data reference at the motor shaft
5	0	Time unit = minutes
4	0	Unit = revolutions
3	0 1	Preferred scaling Parameter scaling
2…0	000 010	No scaling Rotational scaling

Position control operation mode

In the position control operation modes, the IDN 00051 is used to control the drive. The scaling of position command and feedback data is determined by IDNs 00055, 00076, 00079 and 00123.

The IDN 00055 may be used to invert (change sign of) the position command and feedback values, as well as to enable or disable the position limit values (IDN 00049 and IDN 00050).

IDN S-0-0055 Position polarity parameter		
Bit	**Value**	**Description**
15…6	n/a	Reserved
4	0 1	Position limit values are disabled Position limit values are enabled
3	n/a	Reserved
2	0 1	No operation Invert position feedback value
1	n/a	Reserved
0	0 1	No operation Invert position command value

IDN 00076 determines the format of the position data:

- No scaling means that position command and feedback values are passed to and from the drive in raw form without any translation.
- Linear scaling means that the number of position units per one axis revolution (pu/rev) is determined by the IDN 00123 Feed constant.
- Rotational scaling means that the number of position units per one axis revolution (pu/rev) is determined by the IDN 00079 Rotational position resolution.
- When preferred scaling is selected, the scaling is as follows:
  - With linear scaling: 100000 pu/rev (eg, position data value 50000 = 0.5 rev. axis position).
  - With rotational scaling: 3600000 pu/rev (eg, position data value 1800000 = 180 degrees).
- When parameter scaling is selected, the scaling may be changed by writing IDN 00123 (linear scaling) or IDN 00079 (rotational scaling).
- If data reference at the motor shaft is selected, the load gear ratio is set to 1 automatically (IDN 00121, IDN 00122). When data reference at the load is selected, the load gear ratio may be modified.
- Absolute format means that the drive position axis mode is set to a linear mode, which means that the position data range is continuous over multiple axis turns.
- Modulo format means that the drive position axis mode is set to a rollover mode, which means that the position data ranges only within one axis revolution, in other words, after full revolution the position data starts again from zero.

Note: When modulo format is selected, the IDN 00103 Modulo value must match the used position data scaling value, in other words, either IDN 00079 (with rotational scaling) or IDN 00123 (with linear scaling). If IDN 00103 Modulo value is left to the default value 0, the modulo value is automatically set correctly according to the selected scaling mode. The limitation stems from the fact

that it is not possible to arbitrarily select the modulo value in the drive.

IDN S-0-0076 Position data scaling type		
Bit	**Value**	**Meaning**
15…8	0	Reserved
7	0 1	Absolute format Modulo format (see IDN 00103)
6	0 1	Data reference at the motor shaft Data reference at the load
5	0	Reserved
4	0	Linear scaling: unit meter (m) Rotational scaling: unit degrees
3	0 1	Preferred scaling Parameter scaling
2…0	000 001 010	No scaling Linear scaling (see IDN 00123) Rotational scaling

Note: IDN 00077 Linear position data scaling factor and IDN 00078 Linear position data scaling exponent do not take part in the scaling calculations. Linear position scaling is determined only by IDN 00123 Feed constant (pu/rev).

Note: Since the speed feed forward gain parameter in the drive can be set and it is effective regardless of the sercos operation mode, no functional distinction is made between the two supported position control operation modes ("with following error" and "without following error"). In other words, IDN S-0-0296 Velocity feed forward gain is operational also in operation mode “position control, with following error”. If zero feed forward is desired, set the IDN 00296 value to 0.

Homing procedure

The purpose of the homing procedure is to calibrate the position feedback value with respect to the machine zero point. The homing procedure may employ a home switch to point the home position and the home position may be referred to the encoder index pulse (zero pulse). These are configured by IDN 00147, see description below.

S-0-0147 Homing parameter		
Bit	**Value**	**Meaning**
15…9	n/a	Reserved
8	1	Drive-controlled homing, homing distance is not selected
7	0	Drive is positioned at an arbitrary position after a homing procedure
6	0	Marker pulse is evaluated
	1	Marker pulse is not evaluated
5	0	Home switch is evaluated
	1	Home switch is not evaluated
4	n/a	Reserved
3	0	Homing using motor feedback
2	1	Home switch connected to the drive
1	0	First marker pulse after the positive edge of the home switch
	1	First marker pulse after the negative edge of the home switch
0	0	Homing direction positive
	1	Homing direction negative

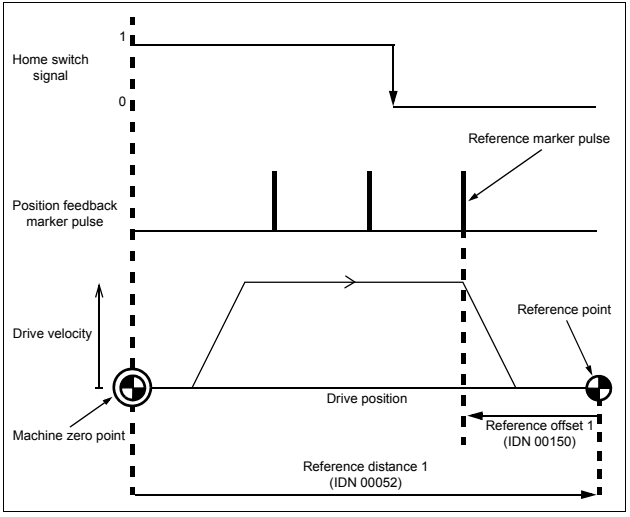
The homing procedure is started by setting and enabling the IDN 00148 Drive controlled homing procedure command. The drive must be enabled before executing the procedure command, and must remain enabled for the duration of the homing procedure. The drive ignores command values after the procedure command has been executed until the master cancels the procedure command (by setting IDN 00148 value back to zero).

After the homing procedure is completed successfully, IDN 00403 Position feedback value status is set to 1, which means that the position data is being referred to the machine zero point. IDN 00403 value is reset back to 0 by the IDN 00191 Cancel reference point procedure command, which also aborts the homing procedure.

The machine zero point is defined in the figure below. IDN 00150 Reference offset 1 is used to set the distance from the home position to the reference point and IDN 00052 Reference distance 1 is used to set the distance from the machine zero point to the reference point:

machine zero point + IDN 00052 - IDN 00150 = home position.

In the figure, the drive moves from left to right. and the homing is configured to stop after the first index marker pulse after the negative edge (falling edge) of the home switch.



IDN 00041 Homing velocity is used as the drive velocity reference during the homing procedure (scaling according to velocity data scaling described above). Drive acceleration is limited by IDN 00042 Homing acceleration. However, if IDN 00138 Bipolar acceleration limit value is less than IDN 00042 value, then it limits the acceleration also during the homing procedure. Scaling of acceleration data is described below.

Note: During the homing procedure, the drive does not follow torque, velocity or position commands.

Acceleration data scaling

The scaling of acceleration data, ie, IDN 00042 and IDN 00138, is configured by IDN 00160:

- No scaling means that acceleration data values are passed to and from the drive in raw form without any translation.
- Rotational scaling means that acceleration data is expressed in rad/s^2.
  - Preferred (default) scaling is 10^{-3} rad/s^2, for example, value 3142 = 3.142 rad/s^2.
  - When parameter scaling is selected, the scaling exponent may be changed (IDN 00162 Acceleration data scaling exponent).

S-0-0160 Acceleration data scaling type		
Bit	**Value**	**Meaning**
15…7	0	Reserved
6	0	Data reference at the motor shaft
5	0	Time unit = second
4	0	Rotational scaling unit = radian
3	0 1	Preferred scaling Parameter scaling
2…0	000 010	No scaling Rotational scaling

Control word and Status word

The Control word is the principal means for controlling the drive from the master system. The adapter module receives the sercos Control word, controls the drive accordingly and translates status information from the drive into the sercos Status word which it sends back to the master. Contents of the sercos Control word are described in the table below. The length of the Control word is 16 bits.

Note: Bit 15 is effective only if bit 14 is '1'. Bit 13 is effective only if bits 15…14 are '11'.

Note: The primary operation mode and secondary operation modes are configured by IDN 00032, 00033, 00034 and 00035.

Note: The sercos Control word does not control drive operation if a transparent profile is selected.

Warning! In the torque control mode, bit 13 (Halt) causes only the torque reference to be set to zero, not a drive stop.

MDT Control word		
Bit	**Name**	**Description**
15	Drive ON/OFF	**0** = Drive OFF - drive is decelerated to stop, power stage remains active for the duration of delay time IDN 00207. **1** = Drive ON - drive follows command values after delay time IDN 00206.
14	Enable drive	**0** = Not enabled - disable power stage, torque is released immediately. **1** = Enable drive - power stage enable.
13	Halt / Restart	**0** = Halt drive - decelerate to stop. **1** = Restart drive - run drive.
12	Reserved	-
11	Operation mode	Used in conjunction with bits 9 and 8.
10	IPOSYNC	Master toggles this bit every control unit cycle.

MDT Control word		
Bit	**Name**	**Description**
9 8	Operation mode	Bits 11, 9, 8 together: **000** = Primary operation mode **001** = Secondary operation mode 1 **010** = Secondary operation mode 2 **011** = Secondary operation mode 3
7	Real-time control bit 2	Destination of this bit is selected by IDN 00303 and IDN 00414.
6	Real-time control bit 1	Destination of this bit is selected by IDN 00301 and IDN 00413.
5 4 3	Data block element	Operation data element number of an IDN being accessed via the service channel.
2	Service channel control	**0** = Transmission in progress **1** = Last transmission
1	Read / Write	**0** = Read service INFO **1** = Write service INFO
0	MHS	Service transport handshake of the master.

The contents of the sercos Status word are described in the table below. The length of the Status word is 16 bits.

AT Status word		
Bit	**Name**	**Description**
15 14	Ready to operate	**00** = Drive not ready for main power on **01** = Drive logic ready for main power on **10** = Torque free (power stage disabled) **11** = Power stage enabled
13	Drive shut down error	**0** = No error **1** = Drive is shut down due to C1D error
12	C2D change	**0** = No change in C2D **1** = Bit toggled in C2D
11	C3D change	**0** = No change in C3D **1** = Bit toggled in C3D

AT Status word		
Bit	**Name**	**Description**
10 9 8	Actual operation mode	**000** = Primary operation mode **001** = Secondary operation mode 1 **010** = Secondary operation mode 2 **011** = Secondary operation mode 3
7	Real-time status bit 2	Source of this bit is selected by IDN 00307 and IDN 00416.
6	Real-time status bit 1	Source of this bit is selected by IDN 00305 and IDN 00415.
5	Procedure command change	**0** = No change in procedure command acknowledgement **1** = Changing procedure command acknowledgement
4	Reserved	-
3	Status command value processing	**0** = Command values ignored **1** = Drive follows command values
2	Service channel error	**0** = No error **1** = Service channel error
1	Busy	Service channel status: **0** = Step finished, ready for new step **1** = Step in progress
0	AHS	Service channel handshake of the drive

Real time bits

The real-time status bits of the sercos Status word and real-time control bits of the sercos Control word (bits 7 and 6 of the Status and Control words) allow two bits of information to be carried within the Control and Status words to and from user selectable IDNs in the module. The destinations and sources for these bits are configured by the following IDNs:

- S-0-0301 Allocation of real-time control bit 1
- S-0-0413 Bit number allocation of real-time control bit 1
- S-0-0303 Allocation of real-time control bit 2
- S-0-0414 Bit number allocation of real-time control bit 2

- S-0-0305 Allocation of real-time status bit 1
- S-0-0415 Bit number allocation of real-time status bit 1
- S-0-0307 Allocation of real-time status bit 2
- S-0-0416 Bit number allocation of real-time status bit 2

The only IDN which should be allocated to real-time control bit 1 and 2 is IDN P-0-0101 DCU CW (IDN 32869). Other IDNs have no function. In the DCU CW of the ACSM1 drive, there are four freely configurable bits for the user application, bits 31…28. When assigning DCU CW bits other than the freely configurable bits, make sure that you do not modify any bit used by the sercos profile. The DCU CW bits 31…28 can be used in the drive for example to control digital outputs etc.

Any IDN can be allocated to real-time status bits. One possible use for the real-time status bits would be to route the DCU SW bits 31…28 to the sercos Status word. For example, digital inputs of the drive can be used by the master in this way.

Note: IDN 00400 Home switch value is always taken from DCU SW bit 31. If IDN 00400 is used by the master, the drive must be configured so that the home switch status is routed to DCU SW bit 31. When IDN 00400 is not used, then DCU SW bit 31 may be used for other purposes, but IDN 00400 will display the value of DCU SW bit 31 in any case.

Transparent communication profile

With the transparent profile, the drive can be controlled directly by its native Control and Status words. The drive Control and Status words (DCU CW and DCU SW) and its raw command values ("reference", REF1 and REF2) and feedback values ("actual", ACT1 and ACT2) are available for the master in IDNs P-0-0101 (32869) … P-0-0106 (32874). See the drive documentation on details of the drive's Control and Status words.

To control the drive via cyclic sercos communication in the transparent profile mode, use the configurable telegram ("application telegram") and map the above mentioned IDNs to the MDT and AT telegrams. The settings are described in the table below.

IDN	Value	Description
00015 Telegram type	7	Configurable telegram
00016 Configuration list of AT	32872	P-0-0104 DCU SW
	32873	P-0-0105 DCU ACT1
	32874	P-0-0106 DCU ACT2
00024 Configuration list of MDT	32869	P-0-0101 DCU CW
	32870	P-0-0102 DCU REF1
	32871	P-0-0103 DCU REF2

Note: Only one reference value (REF1 or REF2) is required to control the drive, therefore, for example, REF2 may be omitted. The same applies to the actual values.

In the transparent profile mode the sercos Control word does not control drive operation. Likewise, the sercos Status word should be ignored in the transparent profile mode.

8

Communication protocol

Contents of this chapter

This chapter describes the communication on an sercos ring and explains fundamental sercos concepts.

Overview of communication

The sercos interface uses optical fiber as the physical data transfer media. The topology of the network is ring and a sercos network is often called a sercos ring. The line coding is NRZI (non-return-to-zero, inverted) with zero bit stuffing after five consecutive ones to maintain receiver synchronization. A fill signal is transmitted when telegrams are not sent to maintain receiver synchronization. Each slave acts as a regenerator and transmits its own telegrams only when requested by the master or automatically at times specified by the master.

There is one master station and up to 254 slave nodes in the ring. One physical slave station may contain multiple slave nodes. Each slave node has a unique address (1…254). Address 0 means that the slave must act only as a passive regenerator. Address 255 is the broadcast address.

Frame structure

Every telegram starts and ends with delimiter 01111110. The delimiter denoting the beginning of a frame is followed by an 8-bit address field. 0 represents a no-station address and 255 is the broadcast address (all-station address).

After the address field, there is a data section with varying length, a frame check sequence (FCS) and a delimiter denoting the end of a frame.

Telegrams

There are three types of telegrams: master synchronization telegram (MST), master data telegram (MDT), and amplifier telegram (AT).

MST

Master synchronization telegram (MST) is transmitted by the master as a broadcast telegram at fixed, predefined intervals. The MST is used to define the network synchronization cycle ("sercos cycle") which keeps the slave devices synchronized with the master and each other. The start of each cycle is defined to be the end of the MST.

MDT

Master data telegram (MDT) is transmitted by the master as a broadcast telegram once every network cycle, at a specified time (t_2) after the end of the last MST. The MDT contains the cyclic command data for each slave. Each slave has its own specified data slot within the MDT.

AT

Amplifier telegram (AT), also called drive telegram, is transmitted by the slave at a specified time (t_1) after the end of the last MST. Each slave is assigned a different t_1 by the master. The AT contains the cyclic status and feedback data from the slave.

Service channel

Non-cyclic data transfer (the sercos "service channel") is initiated and controlled by the master. A slave cannot start a service channel transfer, it can only respond. The service channel is transported within the normal cyclic traffic; there are data slots reserved in the MDT and the AT for the service channel.

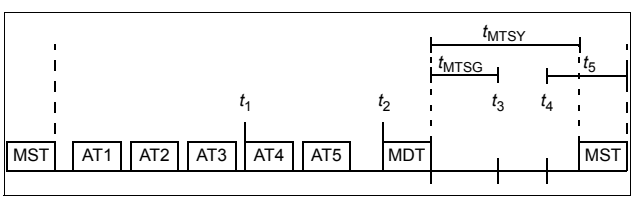
IDNs

The master controls the slaves by reading and writing a predefined set of data objects, called IDNs ("identification numbers"). The IDNs can be read and written by the cyclic transmissions or by the non-cyclic service channel.

sercos cycle and time parameters

The figure below depicts one network cycle in communication phase CP3 or CP4. An MST signifies the start of the cycle, the cycle time (t_{Scyc}) is the time between two MSTs. Time instant zero being the end of the MST. In this example, there are five slaves in the ring, with addresses 1…5, and thus there are five ATs (AT1…AT5). The address of the slave in question is 4. Thus the t_1 for this slave is the starting time of AT4. Each slave has a unique t_1, assigned by the master. MDT starts at time t_2. Time t_3 is called "command value valid time" and this is the time at which the drive may access the command values sent by the master in the MDT. Time t_4 is called "feedback acquisition capture point" and it is the time at which the slave should sample its feedback, for example, encoder position.

Note: t_2, t_3 and t_4 need not occur in numerical order - the master may place them in any order (for example, t_3 and t_4 may occur before t_2 in the cycle).



The slave has multiple IDNs which contain minimum timing requirements for that slave. The master reads these IDNs from each slave and decides the cycle timing for the whole network according to these time parameters, described below. Some of these are also visible in the figure above.

Timing	IDN	Function
t_{1min}	00003	The minimum time at which the slave can send its AT.
t_{MTSG}	00090	The minimum time requirement between the end of the MDT and t_3.
t_{MTSY}	00088	The minimum time requirement between the end of the MDT and start of the next MST.
t_5	00005	The minimum time requirement between t_4 and the end of the next MST.
t_{ATMT}	00004	The minimum time requirement between the end of the slave's AT and t_2.
t_{ATAT}	00087	The minimum time requirement between two ATs sent by the same slave station during single network cycle. This applies only for slaves with multiple logical slave nodes in the same physical slave station. The adapter module controls only one drive and thus it has only one slave node.

Procedure commands

Procedure commands are IDNs which cause the slave to execute a complex process which may take a long time to complete (significantly longer than one cycle time). Procedure commands are set, enabled, interrupted and cancelled by the master by writing the corresponding IDN. Procedure commands may succeed to be correctly executed or fail to execute correctly. Examples of procedure commands are, for example, IDN 00148 Drive controlled homing procedure command and IDN 00099 Reset class 1 diagnostic, etc.

Communication phases

When the sercos ring is in operation, it is in one the defined states, called communication phases (CP). There are five communication phases, CP0…CP4. The master selects the communication phase. When a communication phase is successfully completed, the master may move on and switch to a higher communication phase.

Communication phase 0 (CP0)

The master transmits MSTs and the slaves simply repeat them around the ring, back to the master. This allows the master to establish that the ring is intact. When the master receives back its own transmission correctly, it can switch to CP1.

Communication phase 1 (CP1)

The master interrogates each slave at a time using the address of each slave. This allows the master to establish that all the slaves are present in the ring. If the master can raise all the slaves that should be present in the ring, it can switch to CP2.

Communication phase 2 (CP2)

In CP2 the master can read and write IDNs of the slaves. In this phase the master reads timing requirements from each slave and writes the network timing and telegram configuration to each slave. After these configurations, the master requests each slave to perform the CP3 transition check (IDN 00127) to check the settings. If the checks are completed without errors, the master can switch to CP3.

Communication phase 3 (CP3)

When entering CP3 the cycle time is switched to the operational cycle time, eg, 1 ms or 500 µs. Also the AT and MDT telegrams are now configured for cyclic operation. In this phase the master usually writes any remaining required settings to each slave. After all slaves have been configured for operation, the master requests each slave to perform the CP4 transition check (IDN 00128) to check that the slave is ready for operation. If the checks are completed without errors, the master can switch to CP4.

Communication phase 4 (CP4)

CP4 is the normal operational state, where the drive is allowed to run.

9

Diagnostics

Contents of this chapter

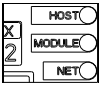
This chapter explains how to trace faults with the status LEDs on the adapter module and diagnostic sercos IDNs.

Fault and warning messages

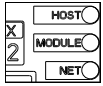
See the firmware manual for fault and warning messages.

LEDs

The adapter module is equipped with three diagnostic LEDs. The LEDs are described below.



Name	Color	Function
HOST	Red	No connection to the host or communication error
	Green	Connection to the host OK
	Orange with MODULE and NET orange	Internal file system error. Error can be cleared by cycling drive power. If the error persists, contact your local ABB representative.
MODULE	Red	Power on, initializing hardware
	Orange	Initializing application
	Green	Initialization complete, module OK
	Red blinking once	Default parameter values written to the drive[1)]
	Red blinking 2 times	Drive address invalid (0 or 255)
	Red blinking 3 times	Bit rate setting invalid (not 2, 4, 8 nor 16; using value 2)
	Red blinking 4 times	TX power level setting invalid (not 1, 2, 3 nor 4; using value 1)
	Red blinking 5 times	Module configuration files corrupted
	Red blinking 8 times	Drive parameter error[2)]
	Red blinking 64 times	Drive cyclic communication error
	Orange with HOST and NET orange	Internal file system error. Error can be cleared by cycling drive power. If the error persists, contact your local ABB representative.



Name	Color	Function
NET	Off (dark)	sercos interface not initialized
	Red blinking fast	No signal detected (FIBBR indication)
	Red flickering	Received signal distorted (RDIST indication). Adjust transmit power level of the previous slave. Check fiber condition.
	Red	CP0
	Orange	CP1 or CP2
	Blinking green	CP3
	Green	CP4

[1] The module writes default values to the drive when it is connected to the drive for the first time. See *FSEA-21 configuration parameters – group A (group 1)*.

[2] The drive parameter error means that there is error in drive parameters or other data received from the drive or that reading or writing drive data has failed.

Certain error states are reported by the MODULE LED blinking in red color. The number of flashes followed by a pause indicates the cause of the error, as described in the table above. The same error code is visible in IDN 00390 Diagnostic number as a decimal value (eg, 3 red flashes: value = 3).

Diagnostic IDNs

The diagnostic IDNs in the sercos interface that provide error information about the slave are described below.

Class 1 diagnostic (IDN 00011)

IDN S-0-00011 Class 1 diagnostic bits are described below. Any class 1 error causes drive shut down.

Class 1 diagnostic bits are reset by the procedure command IDN *00099* (PC99).

Note: All MODULE LED / IDN *00390* error codes are always reset by PC99.

Note: PC99 overwrites the diagnostic message IDN *00095*.

IDN S-0-0011 Class 1 diagnostic	
Bit	**Meaning**
15	Manufacturer-specific error (see IDN *00129*)
14	Reserved
13	Position limit exceeded[1)] (see IDNs *00049*, *00050*)
12	Communication error (see IDN *00014*)
11	Excessive position deviation[2)] (see IDN *00159*)
10	Power supply phase error
9	Undervoltage
8	Overvoltage
7	Overcurrent
6	Reserved
5	Feedback loss
4	Reserved

IDN S-0-0011 Class 1 diagnostic	
Bit	**Meaning**
3	Cooling system failure
2	Motor overtemperature
1	Amplifier overtemperature
0	Reserved

[1] Position limits are active only when in the position control operation mode and the limits are enabled (see IDN 00055) and when position data is being referred to the machine zero point (see IDN 00403).
[2] Position window is active only when in the position control operation mode.

Manufacturer class 1 diagnostic (IDN 00129)

IDN 00129 Manufacturer class 1 diagnostic is an extension of the Class 1 diagnostic. Its bits are described below. Any class 1 error causes drive shut down.

IDN S-0-0129 Manufacturer class 1 diagnostic	
Bit	**Meaning**
15	Error in CP4 transition check while the Ignore errors mode has been selected (see *Drive configuration*)
14	Error during initialization
13	Connection to the drive has failed
12	Failed to read fault code from the drive
11, 10	Reserved
9	Drive parameter error
8	Configuration files corrupted
7…2	Reserved
1	Unsupported drive type
0	Drive fault. See IDN *P-0-0100* (32868).

Manufacturer class 1 diagnostic bits are reset by the procedure command IDN *00099* (PC99). However, there are the following exceptions due to safety concerns:

Bit 15 is reset in CP0 and in CP4 transition check.

Bit 14 is reset by re-initialization of the sercos interface.

Bit 9 is reset only when drive parameters are processed after re-initialization of the sercos interface or after parameter refresh.

When bit 14 Error during initialization is asserted, the corresponding diagnostic message (see IDN *00095*) is probably already overwritten by PC99 and PC127 results caused by the master executing these procedure commands. In this case the diagnostic message on the error, which causes bit 14 to be asserted, can be read in CP2 by phasing the ring back to CP0 and then to CP2.

Bit 9 Drive parameter error means that there is an error in drive parameters or other data received from the drive or that reading or writing drive data has failed.

Interface status (IDN 00014)

IDN 00014 Interface status contains status and error information on the sercos interface. During normal operation bits 2…0 indicate the current communication phase. All bits are described below.

IDN S-0-0014 Interface status	
Bit	**Meaning**
15...12	Reserved
11	IPO-SYNC error
10	Drives with the same address in the ring
9	Switching to the uninitialized operation mode
8	Phase switching without ready acknowledgement
7	Error during phase downshift (not to phase 0)
6	Error during phase upshift (invalid sequence)
5	Invalid phase (phase > 4)
4	MDT failure
3	MST failure
2…0	Communication phase

Diagnostic message (IDN 00095)

IDN 00095 Diagnostic message contains a plain text status or error message from the slave. The message is posted about procedure command results and numerous error situations, etc. It is recommended to read this IDN first when encountering problems during use.

Diagnostic number (IDN 00390)

IDN 00390 Diagnostic number contains the same information as the MODULE LED when it is flashing in red color. See *LEDs*.

Status IDNs

The following IDNs contain status information other than error information.

Class 2 diagnostic (IDN 00012)

IDN 00012 Class 2 diagnostic contains drive warning flags. There are no active warning flags in the adapter module.

IDN S-0-0012 Class 2 diagnostic	
Bit	**Meaning**
15…0	Reserved

Class 3 diagnostic (IDN 00013)

IDN 00013 Class 3 diagnostic contains multiple drive status flags. When any bit in IDN 00013 is changed, the C3D change bit of the sercos Status word is set (bit 11). The Status word bit is negated when IDN 00013 is read by the master. The effect of IDN 00013 changes to the C3D change bit can be masked by IDN *00098*.

The status bits are described below. When the condition is true, the corresponding bit is '1'. Each status flag is functional only if the feedback information it requires is available from the drive to the adapter module. The same status information is also available in IDNs *00330*…*00336*.

IDN S-0-0013 Class 3 diagnostic		
Bit	**Description**	**Notes**
15…7	Reserved	
6	In position	Operational in position control operation modes. See IDN *00336*.
5	$\|n_{command}\| > \|n_{limit}\|$	Operational in the velocity control operation mode. See IDN *00335*.
4	$\|T\| \geq \|T_{limit}\|$	Operational when torque feedback available. See IDN *00334*.
3	$\|T\| \geq \|T_x\|$	Operational when torque feedback available. See IDN *00333*.
2	$\|n_{feedback}\| < \|n_x\|$	Operational when velocity feedback available. See IDN *00332*.
1	$n_{feedback} = 0$	Operational when velocity feedback available. See IDN *00331*.
0	$n_{feedback} = n_{command}$	Operational in the velocity control operation mode. See IDN *00330*.

The following IDNs affect the operation of the status flags:

- 00057 Position window
- 00091 Bipolar velocity limit value
- 00092 Bipolar torque limit value
- 00098 Mask class 3 diagnostic
- 00124 Standstill window
- 00125 Velocity threshold (nx)
- 00126 Torque threshold (Tx)
- 00157 Velocity window

10

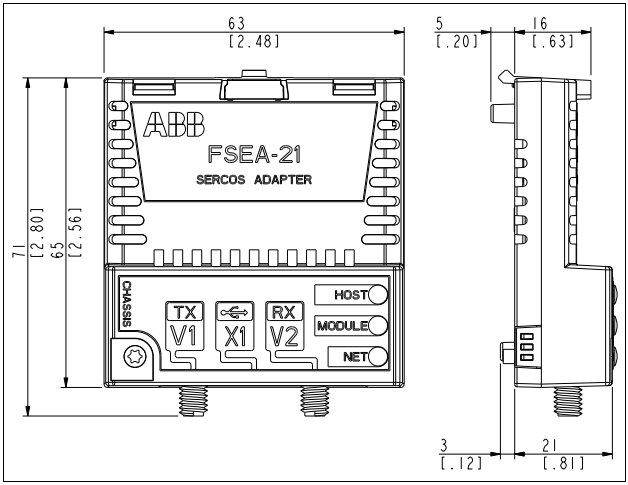
Technical data

Contents of this chapter

This chapter contains the technical data of the adapter module and the sercos link.

FSEA-21

The following figure describes the enclosure of the adapter module from the front and side.



Installation	Into the option slot on the drive
Degree of protection	IP20
Package	Antistatic air bubble sheet (PE)
Ambient conditions	The applicable ambient conditions specified for the drive in its manuals are in effect.
Indicators	Three LEDs: HOST, MODULE and NET
Connectors	20-pin connector to the drive (X2) Optical transmitter for the sercos ring, F-SMA (V1) USB Mini-B type 5-pin connector (X1) Optical receiver for the sercos ring, F-SMA (V2)
Power supply	+3.3 V $\pm$5% max. 500 mA (supplied by the drive)

Compatibility	The adapter module is compatible with: • USB 2.0 Full speed specification, UHCI/OHCI/EHCI host controller • USB-IF Test-ID (TID) 40000133 • FTDI Virtual COM Port (VCP) drivers for Windows (XP, Vista, 7 and 8).
General	Complies with EMC standard EN 61800-3:2004 USB connection functionally isolated from the drive Printed circuit board conformal coated

sercos link

Compatible devices	All sercos-compliant devices (IEC 61491) • Compliance class C (including A and B)
Medium	Plastic (1 mm) or glass (0.23 mm) optical fiber sercos specifications for plastic optical fibers (POF) and hard clad silica glass (HCS) optical fibers:

Aspect	POF	HCS
Core diameter	980 microns	200 microns
Cladding diameter	1000 microns	230 microns
Numeric aperture	0.47	0.37
Bandwidth	≥ 5 MHz * 1 km	≥ 10 MHz * 1 km

Connectors	F-SMA (IEC 60874-2) connector, quality level 5 or better, metallic connector ring
Topology	Ring
Transfer rate	2, 4 or 8 Mbit/s
Cycle times	500 µs to 65 ms in 500 µs steps
Protocol	sercos

11

Appendix A – USB interface

Contents of this chapter

This chapter contains instructions on how to read and write the sercos IDNs of the adapter module directly with the DriveStudio PC tool software in installations where sercos IDNs cannot be accessed through the sercos master.

Overview

Normally the sercos IDNs used for configuring the adapter module are accessed from the sercos master via the sercos interface, see section *IDNs*. For installations where the sercos master does not support user access to the sercos IDNs, the adapter module is equipped with an USB interface which allows access to the IDN database of the adapter module with the DriveStudio PC tool.

Connecting the USB cable

When you connect a USB cable from the PC to the adapter module for the first time, install the FTDI virtual COM port driver into your computer to allow it to communicate with the adapter module.

Follow the instructions on the FTDI website (www.ftdichip.com) to install the drivers.

You do not need to power the drive up when you install the drivers to the PC because the USB bus is powered by the PC. However, you must switch the power on before you start DriveStudio.

Use the latest VCP (virtual COM port) drivers that support the operating system of your computer. The correct device type for the adapter module is FT232R.

To use the USB interface, connect the PC with DriveStudio to the adapter module with a USB cable as follows:

1. Make sure that the adapter module is mechanically and electrically properly installed on the drive.
2. Connect the USB cable to the X1 connector of the adapter module.

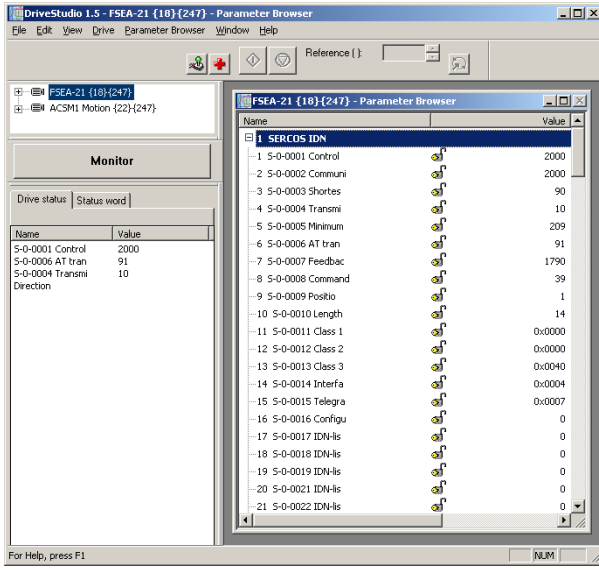
   The X1 connector is a 5-pin USB Mini-B type connector.
3. Start the DriveStudio PC tool.

Accessing the IDN database

When you have completed the installation, DriveStudio should be able to find the adapter module automatically. If the adapter module is not found:

- Check cabling.
- Check the FTDI driver installation.
- Make sure no other application is reserving the COM port of the adapter module.

All IDNs of the adapter module are in parameter group 1. The parameter name consists of a long-form IDN number (such as S-0-0011) and first few letters of the IDN name. The entire name is not displayed as DriveStudio displays only max. 16-character long parameter names as shown in figure below. Refer to chapter *Appendix C – sercos IDNs* for a detailed description of each IDN.



Only simple IDNs with data length of 2 or 4 bytes can be accessed with DriveStudio. Lists or strings cannot be read or written.

After configuring the module, remember to save the IDNs by using the IDN 00264 Backup working memory procedure command. The procedure command may be executed by writing value 3 to the IDN. Set the value back to 0 after use.

WARNING! The USB interface is intended only for off-line configuration of the adapter module. Do not write module IDNs via the USB interface when the sercos interface is in operation.

12

Appendix B – Time offset adjustment

Contents of this chapter

This chapter contains information on the time offset adjustment feature of the adapter module.

Overview of time offset adjustment

In applications where there are multiple axes which are precisely synchronized to one another, it is vital that every axis drive produces the same positioning result at the same time as every other drive in the ring.

sercos specifies when the command values should be taken into use (t_3) and when encoder feedback values should be sampled from the encoder (t_4). However, different drive manufacturers have had different interpretations on what exactly is meant by these timing specifications. Some manufacturers may have even ignored these and take command values into use in the drives whenever they like. Furthermore, the actual control performance from command value valid time to actual axis movement varies between different drive types.

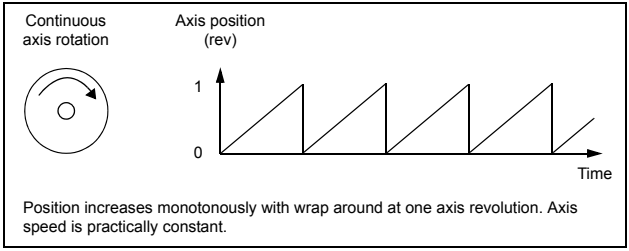
If all drives running the synchronized axes are of the same exact type, there are no problems as all drives have identical internal timing performance. However, in retrofit situations where one drive in the ring is replaced with a new, different drive, problems may arise: An increasing position difference between the different drive

types can be seen as axis rotation speed increases. This is caused by different internal time delays in the different drive types.

The adapter module provides facilities to adjust the internal time delays for position control applications where the axis rotates:

- in one direction only
- at a relatively constant speed (ie, speed changes are slow when compared to the network cycle time).

One such application would be, for example, a printing press. In the figure below, the axis rotates continuously in one direction and the position data wraps around at one full revolution in this example. The axis has reached the operational speed.



Position increases monotonously with wrap around at one axis revolution. Axis speed is practically constant.

In the FSEA-21 it is possible to specify a time offset for the position command value from the adapter module to the drive ("reference value") and for the position feedback value from the drive to the adapter module ("actual value"). A delay can be inserted or alternatively a "negative delay" can also be specified, where the adapter module, in a way, predicts the future by extrapolating a new position value from the previous values. The resolution of the time offsets is one microsecond. In this way the internal performance of the FSEA-21/ACSM1 combination can be matched with that of other types of drives in the same ring and thus it becomes possible to replace old discontinued drives with new ACSM1 drives one by one as the need arises.

Time offset adjustment is only possible in position control operation modes and with rotational scaling selected in IDN 00076 (see *Position control operation mode*).

Reference value time offset

The time offset for position reference value (command) is adjusted by IDN P-0-0021 (32789) REF position time displacement. The adjustment range is −2000 µs … t_{Scyc} (µs), where t_{Scyc} means the sercos cycle time. A positive value means delay, a negative value means prediction for a future position. A zero value means that the reference value time offset system is disabled. If there are no access to the sercos master, the IDN P-0-0021 value can also be set via drive parameters (see *Drive configuration*).

Actual value time offset

The time offset for actual position value (feedback) is adjusted by IDN P-0-0020 (32788) ACT position time displacement. The adjustment range is −2000 µs … 32767 µs. A positive value means delay, a negative value means prediction for a future position. A zero value means that the actual value time offset system is disabled. If there are no access to the sercos master, the IDN P-0-0020 value can also be set via drive parameters (see *Drive configuration*).

Combined effects

When adjusting the REF position time displacement value, the adapter module automatically compensates its effect on the actual position value. Thus you can adjust the two time offset values independently. This compensation, however, places restrictions on the time offset calculation. The *combined ACT value time offset*, which is calculated as shown below, must be equal to or greater than −2000 µs.

Combined ACT time offset = ACT position time displacement − REF position time displacement.

Otherwise the adapter module will not be able to fulfill the specified time offset requirement (the combined ACT time offset will saturate to -2000 µs and the effect of REF position time offset will start to show in the feedback value).

Application example

The example application is a printing press that prints multiple colors. The program in the sercos master is supervising the difference between the position reference and actual position feedback.

When the axis speed increases, at a certain speed the master stops the machine and goes into a fault state. Despite the sercos t_4 specification, with some drives, the position feedback value may be delayed even multiple sercos cycles. When the position error supervision of the master is tailored for this kind of old drives that return the position feedback value with a different time delay than the ACSM1, then the position error of the ACSM1 as seen by the master seems to increase as the axis rotation speed increases, until the supervision limit is exceeded.

Therefore a fixed position offset for the actual position value is not sufficient, but the actual position value must be time-adjusted to fit the expectations of the master. The ACT position time displacement value is adjusted so that position error does not increase with the axis rotation speed. Trial and error may be needed.

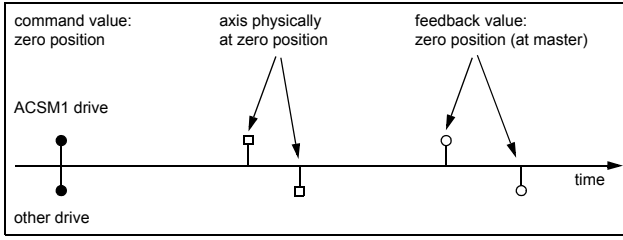
After the position error supervision requirement is fulfilled, the machine can be run at any speed. However, the time delay from the reference position command from the master to the physical axis position (ie, paper position) may still be different from other drives on the same machine. This causes one color to be offset from other colors as the speed increases. To correct this, the delay of passing the reference position from the master to the drive must be adjusted.

It is measured that the color printed by the ACSM1 is always 1.5 ms too early when compared to the other color printed by other drive type (at paper speed of 5 m/s this would be 7.5 mm offset on paper). Thus a value of 1500 µs is set to IDN P-0-0021 (32789) REF position time displacement.

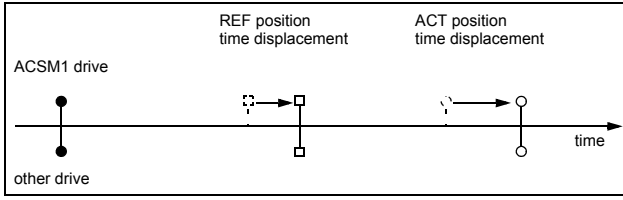
Note that adjustments to the reference position delay are automatically compensated in the actual position delay by the module and thus it is possible to independently adjust the timing of the paper position and actual position value.

The figure below illustrates the situation before the adjustment, from the point of view of the master. The axes are rotating at high speed. The master is controlling the speed and position of the axes

by cyclic position commands. At some point, the master issues a position command value of, for example, 0 to all axes. After some time, the axes reach this position. The encoder position is sampled at each drive and the position feedback value is sent back to the master in the next AT telegram. However, there are differences in the results. Due to the different internal workings of the drives, the other drive reaches the axis position slightly later than the ACSM1. Furthermore, the position feedback from the other drive (which should be sampled at the same time in each drive) arrives at the master a full sercos cycle late.



To match the results generated by the two drives, the REF and ACT position time displacement is used to create the necessary delays in the ACSM1. The figure below illustrates the same situation after the adjustments.



13

Appendix C – sercos IDNs

Contents of this chapter

This chapter contains a list of all sercos IDNs supported by the adapter module, and the attributes and descriptions of these IDNs.

Overview of sercos IDNs

The IDNs (identification numbers) are predefined data objects that contain the configuration and operation data of the slave, similar to drive parameters. The actual identification number can be expressed in two formats: short and long.

The short format is the 16-bit number expressed as an unsigned decimal number: 1...65535. Numbers 1...32767 are reserved for the standard IDNs defined by the sercos specification and numbers 32768...65535 are reserved for the product specific IDNs whose content and functions are specific for each device type.

In the long format, the 16-bit number is expressed in the following way: S/P-x-yyyy.

Code	Meaning
S	Bit 15 = 0: Standard IDN
P	Bit 15 = 1: Product-specific IDN
x	Bits 14…12, value = 0…7
yyyy	Bits 11…0, value = 0000…4095

Examples: IDN 00123 = S-0-0123. IDN 32770 = P-0-0002. IDN 32968 = P-0-0200.

sercos IDNs supported by the adapter module

The adapter module supports the sercos IDNs listed in the table below.

In the table some of the attributes of each IDN are also listed:

- In the header, the IDN number is shown in the short and long format.
- **Display type** means the format in which the data value is shown by the master.
- **Decimals** means the number of digits after the decimal point when the data is shown by the master.
- **Writable in** shows the communication phases where the IDN can be written to.
- **Non-volatile** means that the IDN can be saved to non-volatile memory.

00001	*S-0-0001*	*Control unit cycle time (tNcyc)*
Display type	unsigned decimal	Defines the cyclic intervals during which the control unit makes new command values available. t_{Ncyc} must be an integer multiple of t_{Scyc}.
Decimals	0	
Writable in	CP2	
Unit	µs	
Min	500	
Max	65000	
Default	-	

00002	*S-0-0002*	*Communication cycle time (tScyc)*
Display type	unsigned decimal	Cycle time of the network. Allowed values are 500 µs … 65 ms in 500 µs increments.
Decimals	0	
Writable in	CP2	
Unit	µs	
Min	500	
Max	65000	
Default	-	

00003	*S-0-0003*	*Shortest AT transmission starting time (t1min)*
Display type	unsigned decimal	Minimum time required by the slave between the end of the MST and the start of the AT transmission.
Decimals	0	
Writable in	-	
Unit	µs	
Min	-	
Max	-	
Default	12	

00004	*S-0-0004*	*Transmit/receive transition time (tATMT)*
Display type	unsigned decimal	Minimum time required by the slave to switch from transmitting the AT to receiving the MDT.
Decimals	0	
Writable in	-	
Unit	µs	
Min	-	
Max	-	
Default	0	

00005	*S-0-0005*	*Minimum feedback processing time (t5)*
Display type	unsigned decimal	Minimum time required by the slave between t_4 (feedback acquisition time) and the end of the MST.
Decimals	0	
Writable in	-	
Unit	µs	
Min	-	
Max	-	
Default	Drive dependent	

00006	*S-0-0006*	*AT transmission starting time (t1)*
Display type	unsigned decimal	Time at which the slave transmits its AT.
Decimals	0	
Writable in	CP2	
Unit	µs	
Min	IDN 3	
Max	-	
Default	-	

00007	*S-0-0007*	*Feedback acquisition capture point (t4)*
Display type	unsigned decimal	Time at which the slave samples the feedback for the master. It is required that: $t_4 \leq (t_{Scyc} - t_5)$ To achieve accurate feedback acquisition with the ACSM1, t_4 synchronization must be selected with drive par. 51.06.
Decimals	0	
Writable in	CP2	
Unit	µs	
Min	0	
Max	IDN 2	
Default	-	

00008	*S-0-0008*	*Command value valid time (t3)*
Display type	unsigned decimal	Time at which and after which the drive is allowed to access the command values received in the MDT. To achieve accurate command value latching with the ACSM1, t_3 synchronization must be selected with drive par. 51.06.
Decimals	0	
Writable in	CP2	
Unit	µs	
Min	0	
Max	IDN 2	
Default	-	

00009	*S-0-0009*	*Position of data record in MDT*
Display type	unsigned decimal	Starting byte position of the data record for the slave within the MDT.
Decimals	0	
Writable in	CP2	
Unit	-	
Min	1	
Max	-	
Default	-	

00010	*S-0-0010*	*Length of MDT*
Display type	unsigned decimal	Length of the master data telegram (MDT) in bytes.
Decimals	0	
Writable in	CP2	
Unit	Byte	
Min	4	
Max	65534	
Default	-	

00011	*S-0-0011*	*Class 1 diagnostic*
Display type	binary	Slave error information. Any class 1 error causes drive shutdown. For an explanation of the bits, see *Class 1 diagnostic (IDN 00011)*.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	0	

00012	*S-0-0012*	*Class 2 diagnostic*
Display type	binary	Drive warning information. For an explanation of the bits, see *Manufacturer class 1 diagnostic (IDN 00129)*.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	0	

00013	*S-0-0013*	*Class 3 diagnostic*
Display type	binary	Drive status information. When any bit in IDN 00013 is changed, the C3D change bit of the Status word is set. Effect of IDN 00013 changes to the C3D change bit can be masked by IDN *00098*. For an explanation of the bits, see *Class 3 diagnostic (IDN 00013)*.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	0	

00014	*S-0-0014*	*Interface status*
Display type	binary	Status and error information of the sercos interface. For an explanation of the bits, see *Interface status (IDN 00014)*.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	0	

00015	*S-0-0015*	*Telegram type*
Display type	binary	Telegram type for the slave. Telegram type defines contents of the AT and the MDT. See *Telegram types*.
Decimals	0	
Writable in	CP2	
Unit	-	
Min	0	
Max	0xFFFF	
Default	-	

00016	*S-0-0016*	*Configuration list of AT*
Display type	IDN	List of IDNs to be transmitted by the slave in the AT when using telegram type 7 (configurable telegram). Allowed IDNs are listed in IDN *00187*. Make sure the total data length does not exceed IDN *00185*.
Decimals	0	
Writable in	CP2	
Unit	-	
Min	-	
Max	-	
Default	-	

00017	*S-0-0017*	*IDN-list of all operation data*
Display type	IDN	List of all IDNs supported by the slave.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	-	

00018	*S-0-0018*	*IDN-list of operation data for CP2*
Display type	IDN	List of IDNs which the master must write in CP2. If telegram type 7 (configurable telegram) is used, then also IDN *00016* and IDN *00024* should be set in CP2.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	{1, 2, 6, 7, 8, 9, 10, 15, 89}	

00019	*S-0-0019*	*IDN-list of operation data for CP3*
Display type	IDN	List of IDNs which the master must write in CP3. No IDNs are absolutely required to be written in CP3 because all the IDNs, which the slave checks in the CP4 transition check, can be saved in the slave.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	-	

00021	*S-0-0021*	*IDN-list of invalid operation data for CP2*
Display type	IDN	If procedure command IDN *00127* (CP3 transition check) fails, then all IDNs which are considered invalid are placed in this list.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	-	

00022	*S-0-0022*	*IDN-list of invalid operation data for CP3*
Display type	IDN	If procedure command IDN *00128* (CP4 transition check) fails, then all IDNs which are considered invalid are placed in this list.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	-	

00024	*S-0-0024*	*Configuration list of MDT*
Display type	IDN	List of IDNs which will be transmitted by the master in the MDT when using telegram type 7 (configurable telegram). Allowed IDNs are listed in IDN *00188*. Make sure the total data length does not exceed IDN *00186*.
Decimals	0	
Writable in	CP2	
Unit	-	
Min	-	
Max	-	
Default	-	

00025	*S-0-0025*	*IDN-list of all procedure commands*
Display type	IDN	List of all procedure command IDNs supported by the slave.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	-	

00028	*S-0-0028*	*MST error counter*
Display type	unsigned decimal	Count of invalid MSTs in CP3 and CP4. Counter is reset to 0 on the CP3 transition. Counter saturates to 65535. After two consecutive invalid MSTs, the slave switches back to CP0. Master can also reset the counter at will by writing any desired value.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	0	
Max	65535	
Default	0	

00029	*S-0-0029*	*MDT error counter*
Display type	unsigned decimal	Counter of invalid MDTs in CP3 and CP4. Counter is reset to 0 on the CP3 transition. Counter saturates to 65535. Master can also reset the counter at will by writing any desired value.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	0	
Max	65535	
Default	0	
00030	*S-0-0030*	*Manufacturer version*
Display type	text	Name and version of the fieldbus adapter firmware (eg, "OFCS0125").
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	OFCSnnnn	
00032	*S-0-0032*	*Primary operation mode*
Display type	binary	See *Supported modes of operation*.
Decimals	0	
Writable in	CP2, CP3	
Unit	-	
Min	-	
Max	-	
Default	0	Non-volatile

00033	*S-0-0033*	*Secondary operation mode 1*
00034	*S-0-0034*	*Secondary operation mode 2*
00035	*S-0-0035*	*Secondary operation mode 3*
Display type	binary	See *Supported modes of operation*.
Decimals	0	
Writable in	CP2, CP3	
Unit	-	
Min	-	
Max	-	
Default	0	Non-volatile

00036	*S-0-0036*	*Velocity command value*
Display type	signed decimal	Command value for the drive while in the velocity control operation mode.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	vu	
Min	-2^{31}	
Max	$2^{31} - 1$	
Default	0	

00037	*S-0-0037*	*Additive velocity command value*
Display type	signed decimal	Added to the velocity command value IDN 00036. Result is the velocity command sent to the drive.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	vu	
Min	-2^{31}	
Max	$2^{31} - 1$	
Default	0	

00040	*S-0-0040*	*Velocity feedback value 1*
Display type	signed decimal	Velocity feedback value from the drive. Operational only if actual velocity is available from the drive, see *Required drive parameter configuration for ACSM1 drives*.
Decimals	0	
Writable in	-	
Unit	vu	
Min	-	
Max	-	
Default	0	
00041	*S-0-0041*	*Homing velocity*
Display type	signed decimal	Velocity reference to be used by the drive during the drive-controlled homing procedure (see IDN *00148*). Actual homing velocity may be limited to a smaller value by drive parameters.
Decimals	0	
Writable in	CP2, CP3	
Unit	vu	
Min	0	
Max	$2^{31} - 1$	
Default	-	Non-volatile
00042	*S-0-0042*	*Homing acceleration*
Display type	signed decimal	Maximum acceleration and deceleration during the drive-controlled homing procedure. Actual acceleration may be limited to a smaller value by IDN *00138* or drive parameters.
Decimals	0	
Writable in	CP2, CP3	
Unit	au	
Min	0	
Max	$2^{31} - 1$	
Default	-	Non-volatile

00043	*S-0-0043*	*Velocity polarity parameter*
Display type	binary	Polarity of the velocity input and output data can be reversed by this IDN. For an explanation of the bits, see *Velocity control operation mode*.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	-	
Max	-	
Default	0	Non-volatile

00044	*S-0-0044*	*Velocity data scaling type*
Display type	binary	See *Velocity control operation mode*.
Decimals	0	
Writable in	CP2, CP3	
Unit	-	
Min	2	
Max	0xA	
Default	2	Non-volatile

00045	*S-0-0045*	*Velocity data scaling factor*
Display type	unsigned decimal	Scaling factor for velocity data when rotational scaling is selected. Value is fixed to 1.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	1	

00046	*S-0-0046*	*Velocity data scaling exponent*
Display type	signed decimal	Scaling exponent for velocity data when rotational scaling is selected. See *Velocity control operation mode*.
Decimals	0	
Writable in	CP2, CP3	
Unit	-	
Min	-9	
Max	0	
Default	-4	Non-volatile

00047	*S-0-0047*	*Position command value*
Display type	signed decimal	Command value for the drive while in the position control operation mode.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	pu	
Min	-2^{31}	
Max	$2^{31} - 1$	
Default	0	

00049	*S-0-0049*	*Positive position limit value*
Display type	signed decimal	Maximum allowed distance in the positive direction. Position limits are used only when position data is being referred to the machine zero point (see IDN *00403*), and position limits are enabled (see IDN *00055*).
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	pu	
Min	-	
Max	-	
Default	$2^{31} - 2$	Non-volatile

00050	*S-0-0050*	*Negative position limit value*
Display type	signed decimal	Maximum allowed distance in the negative direction. Position limits are used only when position data is being referred to the machine zero point (see IDN *00403*), and position limits are enabled (see IDN *00055*).
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	pu	
Min	-2^{31}	
Max	$2^{31} - 1$	
Default	-2^{31}	Non-volatile

00051	*S-0-0051*	*Position feedback value 1*
Display type	signed decimal	Position feedback value from the drive. Operational only if actual position is available from the drive, see *Required drive parameter configuration for ACSM1 drives*.
Decimals	0	
Writable in	-	
Unit	pu	
Min	-	
Max	-	
Default	0	

00052	*S-0-0052*	*Reference distance 1*
Display type	signed decimal	Defines the distance between the machine zero point and the reference point. Master decides the position of the 'machine zero point' in relation to the 'reference point' with this IDN.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	pu	
Min	-2^{31}	
Max	$2^{31} - 1$	
Default	0	Non-volatile

00055	*S-0-0055*	*Position polarity parameter*
Display type	binary	Polarity of the position input and output data can be reversed by this IDN. For an explanation of the bits, see *Position control operation mode*.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	-	
Max	-	
Default	0	Non-volatile

00057	*S-0-0057*	*Position window*
Display type	unsigned decimal	When the difference between the position command value and the position feedback value is within the range of the position window, the drive sets the status "in position" (IDN *00336*).
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	pu	
Min	0	
Max	$2^{31} - 1$	
Default	$2^{31} - 1$	Non-volatile

00076	*S-0-0076*	*Position data scaling type*
Display type	binary	See *Position control operation mode*. **Note:** If option "Data reference at the motor shaft" is selected, the values of IDN 00121 and IDN 00122 (load gear ratio) are set to 1 automatically by the adapter module.
Decimals	0	
Writable in	CP2, CP3	
Unit	-	
Min	0	
Max	0xCA	
Default	-	Non-volatile

00077	*S-0-0077*	*Linear position data scaling factor*
Display type	signed decimal	Although this IDN exists and is writable, it is not used in the scaling calculation. Linear position scaling is dictated only by the feed constant (IDN *00123*).
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	1	
Max	1	
Default	1	
00078	*S-0-0078*	*Linear position data scaling exponent*
Display type	signed decimal	Although this IDN exists and is writable, it is not used in the scaling calculation. Linear position scaling is dictated only by the feed constant (IDN *00123*).
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	-9	
Max	0	
Default	-7	Non-volatile
00079	*S-0-0079*	*Rotational position resolution*
Display type	unsigned decimal	Resolution of position data (pu/rev) when rotational scaling is selected. See *Position control operation mode*.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	pu/rev	
Min	100	
Max	100000000	
Default	-	Non-volatile

00080	*S-0-0080*	*Torque command value*
Display type	signed decimal	Command value for the drive while in the torque control operation mode.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	tu	
Min	-16000	
Max	16000	
Default	0	

00081	*S-0-0081*	*Additive torque command value*
Display type	signed decimal	Added to the torque command value IDN 00080. Result is the torque command sent to the drive.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	tu	
Min	-32768	
Max	32767	
Default	0	

00084	*S-0-0084*	*Torque feedback value*
Display type	signed decimal	Torque feedback value from the drive. Operational only if actual torque is available from the drive, see *Required drive parameter configuration for ACSM1 drives*.
Decimals	0	
Writable in	-	
Unit	tu	
Min	-	
Max	-	
Default	0	

00085	*S-0-0085*	*Torque polarity parameter*
Display type	binary	Polarity of the torque input and output data can be reversed by this IDN. For an explanation of the bits, see *Torque control operation mode*.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	-	
Max	-	
Default	0	Non-volatile

00086	*S-0-0086*	*Torque/force data scaling type*
Display type	binary	See *Torque control operation mode*.
Decimals	0	
Writable in	CP2, CP3	
Unit	-	
Min	0	
Max	0xA	
Default	0	Non-volatile

00087	*S-0-0087*	*Transmit to transmit recovery time (tATAT)*
Display type	unsigned decimal	Time required by the slave between multiple ATs sent by the same slave. Not significant when the slave has only one drive (such as the FSEA-21).
Decimals	0	
Writable in	-	
Unit	µs	
Min	-	
Max	-	
Default	0	

00088	*S-0-0088*	*Receive to receive recovery time (tMTSY)*
Display type	unsigned decimal	Minimum time required by the slave between the end of the MDT and the start of the MST.
Decimals	0	
Writable in	-	
Unit	µs	
Min	-	
Max	-	
Default	Drive dependent	

00089	*S-0-0089*	*MDT transmission starting time (t2)*
Display type	unsigned decimal	Time at which the master will send the MDT during CP3 and CP4.
Decimals	0	
Writable in	CP2	
Unit	µs	
Min	0	
Max	IDN 2	
Default	-	

00090	*S-0-0090*	*Command value proceeding time (tMTSG)*
Display type	unsigned decimal	Minimum time required by the slave between the end of the MDT and t_3 (command value valid time).
Decimals	0	
Writable in	-	
Unit	µs	
Min	-	
Max	-	
Default	Drive dependent	

00091	*S-0-0091*	*Bipolar velocity limit value*
Display type	signed decimal	Describes the maximum allowable velocity command value in both directions. If the velocity limit value is exceeded, the status "$n_{command} > n_{limit}$" in C3D is set.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	vu	
Min	0	
Max	$2^{31} - 1$	
Default	-	Non-volatile

00092	*S-0-0092*	*Bipolar torque limit value*
Display type	unsigned decimal	Limits the maximum torque symmetrically in both directions. If the torque limit value is exceeded, the drive sets the status "$T > T_{limit}$" in C3D (IDN *00013*).
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	tu	
Min	0	
Max	16000	
Default	0	Non-volatile

00093	*S-0-0093*	*Torque/force data scaling factor*
Display type	unsigned decimal	Scaling factor for torque data when rotational scaling is selected. Value is fixed to 1.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	1	

00094	*S-0-0094*	*Torque/force data scaling exponent*
Display type	signed decimal	Scaling exponent for torque data when rotational scaling is selected. See *Torque control operation mode*.
Decimals	0	
Writable in	CP2, CP3	
Unit	-	
Min	-4	
Max	0	
Default	-2	Non-volatile

00095	*S-0-0095*	*Diagnostic message*
Display type	text	Status or error message from the slave. Describes, for example, procedure command results.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	-	

00096	*S-0-0096*	*Slave arrangement (SLKN)*
Display type	hex	Contains information on drive addresses of the slave's drives. FSEA-21 supports only one drive.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	-	

00097	*S-0-0097*	*Mask class 2 diagnostic*
Display type	binary	Effect of IDN *00012* bit changes to the C2D change bit of the Status word can be enabled or disabled one by one with this IDN. Bit value 1 = corresponding C2D bit is unmasked (enabled). If the C2D bit toggles, then Status word C2D change bit is set.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	0	
Max	0xFFFF	
Default	0xFFFF	Non-volatile

00098	*S-0-0098*	*Mask class 3 diagnostic*
Display type	binary	Effect of IDN *00013* bit changes to the C3D change bit of the Status word can be enabled or disabled one by one with this IDN. Bit value 1 = corresponding C3D bit is unmasked (enabled). If the C3D bit toggles, then Status word C3D change bit is set.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	0	
Max	0xFFFF	
Default	0xFFFF	Non-volatile

00099	*S-0-0099*	*Reset class 1 diagnostic*
Display type	unsigned decimal	Procedure command that attempts to reset: • Class 1 diagnostic (IDN *00011*) • Errors in interface status (IDN *00014*) • Manufacturer class 1 diagnostic (IDN *00129*) • Drive fault
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	-	
Max	-	
Default	-	

00100	*S-0-0100*	*Velocity loop proportional gain*
Display type	unsigned decimal	Proportional gain (Kp) of the drive's speed controller. Scaling is drive specific.
Decimals	2	
Writable in	CP2, CP3	
Unit	-	
Min	0	
Max	20000	
Default	-	Non-volatile

00101	*S-0-0101*	*Velocity loop integral action time*
Display type	unsigned decimal	Integration time of the drive's speed controller. Setting the maximum value 6553.5 ms causes the integrator to be switched off.
Decimals	1	
Writable in	CP2, CP3	
Unit	ms	
Min	0	
Max	65535	
Default	-	Non-volatile

00103	*S-0-0103*	*Modulo value*
Display type	signed decimal	Active only if modulo format is selected (see IDN *00076*). Value must be set according to IDN 00079 or IDN *00123*, depending on whether rotational or linear position data scaling is selected. Limitation stems from the fact that it is not possible to arbitrarily select the modulo value in the drive. If the modulo value has not been set by the master, it will be set automatically according to the selected scaling mode. See *Position control operation mode*.
Decimals	0	
Writable in	CP2, CP3	
Unit	pu	
Min	1	
Max	$2^{31} - 1$	
Default	0	Non-volatile

00104	*S-0-0104*	*Position loop KV-factor*
Display type	unsigned decimal	Drive position control loop proportional gain.
Decimals	2	
Writable in	CP2, CP3	
Unit	(m/min)/mm	
Min	0	
Max	65535	
Default	-	Non-volatile

00116	*S-0-0116*	*Resolution of feedback 1*
Display type	unsigned decimal	Drive pulse encoder resolution. Applicable only if a pulse encoder is used. **Note:** It is recommended to do encoder configuration at the drive - not via this IDN.
Decimals	0	
Writable in	CP2, CP3	
Unit	-	
Min	0	
Max	65535	
Default	-	Non-volatile

00121	*S-0-0121*	*Input revolutions of load gear*
Display type	signed decimal	Drive gear ratio multiplier. **Note:** If option "Data reference at the motor shaft" is selected in IDN 00076, the adapter module sets the value to 1 automatically.
Decimals	0	
Writable in	CP2, CP3	
Unit	rev	
Min	1	
Max	$2^{31} - 1$	
Default	1	Non-volatile

00122	*S-0-0122*	*Output revolutions of load gear*
Display type	signed decimal	Drive gear ratio denominator. **Note:** If option "Data reference at the motor shaft" is selected in IDN 00076, the adapter module sets the value to 1 automatically.
Decimals	0	
Writable in	CP2, CP3	
Unit	rev	
Min	-2^{31}	
Max	$2^{31} - 1$	
Default	1	Non-volatile

00123	*S-0-0123*	*Feed constant*
Display type	unsigned decimal	Resolution of position data (pu/rev) when linear scaling is selected. See *Position control operation mode*.
Decimals	0	
Writable in	CP2, CP3	
Unit	pu/rev	
Min	1	
Max	10000000	
Default	100000	Non-volatile

00124	*S-0-0124*	*Standstill window*
Display type	signed decimal	When the velocity feedback value is less than or equal to the standstill window, the drive sets the status "$n_{feedback}$ = 0" in C3D (see IDN *00331*).
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	vu	
Min	0	
Max	$2^{31} - 1$	
Default	0	Non-volatile

00125	*S-0-0125*	*Velocity threshold (nx)*
Display type	signed decimal	If the velocity feedback value falls below the velocity threshold n_x, the drive sets the status "$n_{feedback} < n_x$" (IDN *00332*) in C3D.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	vu	
Min	0	
Max	$2^{31} - 1$	
Default	0	Non-volatile

00126	*S-0-0126*	*Torque threshold*
Display type	signed decimal	If the torque feedback value exceeds the torque threshold T_x, the drive sets the status "$T > T_x$" in C3D (IDN *00333*).
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	tu	
Min	0	
Max	32767	
Default	0	Non-volatile

00127	*S-0-0127*	*CP3 transition check*
Display type	unsigned decimal	Master uses this procedure command to instruct the slave to check that all necessary IDNs have been transferred before switching from CP2 to CP3. If the procedure command fails, IDN 00021 will contain a list of the invalid IDNs.
Decimals	0	
Writable in	CP2	
Unit	-	
Min	-	
Max	-	
Default	-	

00128	*S-0-0128*	*CP4 transition check*
Display type	unsigned decimal	Master uses this procedure command to instruct the slave to check that all necessary IDNs have been transferred before switching from CP3 to CP4. If the procedure command fails, IDN *00022* will contain a list of the invalid IDNs. See also parameter *CP4 TRANSITION MODE*.
Decimals	0	
Writable in	CP3	
Unit	-	
Min	-	
Max	-	
Default	-	

00129	*S-0-0129*	*Manufacturer class 1 diagnostic*
Display type	binary	Extension of IDN *00011* Class 1 diagnostic. Any class 1 error causes drive shutdown. For explanation of the bits, see *Manufacturer class 1 diagnostic (IDN 00129)*.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	0	

00134	*S-0-0134*	*Master Control word*
Display type	binary	Master can read the sercos Control word back via the service channel.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	-	

00135	*S-0-0135*	*Drive Status word*
Display type	binary	Master can read the sercos Status word via the service channel.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	-	

00138	*S-0-0138*	*Bipolar acceleration limit value*
Display type	signed decimal	Limits the maximum acceleration ability of the drive symmetrically in both directions. Does not affect the torque control or velocity control operation modes, only the position control operation mode or the homing procedure. Actual acceleration may be limited to a smaller value by other parameters.
Decimals	0	
Writable in	CP2, CP3	
Unit	au	
Min	0	
Max	$2^{31} - 1$	
Default	-	Non-volatile

00142	*S-0-0142*	*Application type*
Display type	text	Master may write and save an arbitrary text string into this IDN. If the master has not written this IDN, then the drive type is displayed.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	-	
Max	-	
Default	-	Non-volatile

00143	*S-0-0143*	*SERCOS interface version*
Display type	text	Version of the sercos interface.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	V02.01	

00147	*S-0-0147*	*Homing parameter*
Display type	binary	Configuration of the drive-controlled homing procedure. See *Homing procedure*.
Decimals	0	
Writable in	CP2, CP3	
Unit	-	
Min	-	
Max	-	
Default	-	Non-volatile

00148	*S-0-0148*	*Drive controlled homing procedure command*
Display type	unsigned decimal	Procedure command to start the drive-controlled homing procedure. See *Homing procedure*.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	-	
Max	-	
Default	-	

00150	*S-0-0150*	*Reference offset 1*
Display type	signed decimal	Defines the distance between the reference marker pulse of position feedback 1 and the reference point. With absolute encoders this parameter is the distance between the real encoder zero point and the zero point of the position feedback value.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	pu	
Min	-2^{31}	
Max	$2^{31} - 1$	
Default	-	Non-volatile

00157	*S-0-0157*	*Velocity window*
Display type	signed decimal	If the difference between the total velocity command value and the velocity feedback is less than the velocity window, then the drive sets status "$n_{feedback} = n_{command}$" in C3D (see IDN *00330*).
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	vu	
Min	0	
Max	$2^{31} - 1$	
Default	0	Non-volatile

00159	*S-0-0159*	*Monitoring window*
Display type	unsigned decimal	Maximum allowable position deviation. If the position error exceeds this value, the drive sets an error "excessive position deviation" in C1D (see IDN *00011*).
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	pu	
Min	0	
Max	$2^{31} - 1$	
Default	536 870 911	Non-volatile

00160	*S-0-0160*	*Acceleration data scaling type*
Display type	binary	See *Acceleration data scaling*.
Decimals	0	
Writable in	CP2, CP3	
Unit	-	
Min	0	
Max	0xA	
Default	0x2	Non-volatile

00161	*S-0-0161*	*Acceleration data scaling factor*
Display type	unsigned decimal	Scaling factor for acceleration data when rotational scaling is selected. Value is fixed to 1.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	1	

00162	*S-0-0162*	*Acceleration data scaling exponent*
Display type	signed decimal	Scaling exponent for acceleration data when rotational scaling is selected. See *Acceleration data scaling*.
Decimals	0	
Writable in	CP2, CP3	
Unit	-	
Min	-6	
Max	0	
Default	-3	Non-volatile

00181	*S-0-0181*	*Manufacturer class 2 diagnostic*
Display type	binary	Fixed value is 0; manufacturer class 2 diagnostic is not used by the adapter module.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	0	

00185	*S-0-0185*	*Length of the configurable data record in the AT*
Display type	unsigned decimal	Maximum AT data length, in bytes, which is supported by the slave when using telegram type 7 (configurable telegram).
Decimals	0	
Writable in	-	
Unit	Byte	
Min	-	
Max	-	
Default	40	

00186	*S-0-0186*	*Length of the configurable data record in the MDT*
Display type	unsigned decimal	Maximum MDT data record length for the slave, in bytes, which is supported by the slave when using telegram type 7 (configurable telegram).
Decimals	0	
Writable in	-	
Unit	Byte	
Min	-	
Max	-	
Default	40	

00187	*S-0-0187 I*	*IDN-list of configurable data in the AT*
Display type	IDN	List of IDNs which can be configured in the AT when using telegram type 7 (configurable telegram).
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	{41, 51, 84, 189, 32872, 32873, 32874}	

00188	*S-0-0188*	*IDN-list of configurable data in the MDT*
Display type	IDN	List of IDNs which can be configured in the MDT for the slave when using telegram type 7 (configurable telegram).
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	{36, 37, 47, 80, 81, 32869, 32870, 32871}	

00189	*S-0-0189*	*Following distance*
Display type	signed decimal	Indicates the current position error. Following distance = position command value - position feedback value.
Decimals	0	
Writable in	-	
Unit	pu	
Min	-	
Max	-	
Default	0	

00191	*S-0-0191*	*Cancel reference point procedure command*
Display type	unsigned decimal	Resets the position feedback value status (see IDN *00403*). If executed during the homing procedure, it is also aborted.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	-	
Max	-	
Default	-	
00192	*S-0-0192*	*IDN-list of backup operation data*
Display type	IDN	List of IDNs which determine the configuration of the slave.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	{32, 33, 34, 35, 41, 42, 43, 44, 46, 49, 50, 52, 55, 57, 76, 77, 78, 79, 85, 86, 91, 92, 94, 97, 98, 100, 101, 103, 104, 116, 121, 122, 123, 124, 125, 126, 138, 142, 147, 150, 157, 159, 160, 162, 206, 207, 296, 301, 303, 305, 307, 413, 414, 415, 416, 32773, 32774, 32775, 32776, 32788, 32789, 32790}	
00206	*S-0-0206*	*Drive on delay time*
Display type	unsigned decimal	Adjustable delay between drive on command from the master and release of the drive reference. Drive starts to modulate when the master sets Control word bit 15 "drive on", but the drive follows command values after this delay. **Note:** With the ACSM1 the granularity of this delay is 500 µs.
Decimals	1	
Writable in	CP2, CP3	
Unit	ms	
Min	0	
Max	65535	
Default	0	

00207	*S-0-0207*	*Drive off delay time*
Display type	unsigned decimal	Adjustable delay between stopping of the drive and disabling of the power stage. After the master resets Control word bit 15 "drive off command" and the motor actual speed falls below an internal limit, the drive off delay time starts. During this delay the inverter is kept live and the motor magnetized for quick restart. **Note:** With the ACSM1 the granularity of this delay is 1 ms.
Decimals	1	
Writable in	CP2, CP3	
Unit	ms	
Min	0	
Max	65535	
Default	-	Non-volatile

00264	*S-0-0264*	*Backup working memory procedure command*
Display type	unsigned decimal	Saves all storable IDNs into the fieldbus adapter and the drive. Check IDN *00095* afterwards to verify that all IDNs were successfully saved.
Decimals	0	
Writable in	CP2, CP3	
Unit	-	
Min	-	
Max	-	
Default	-	

00292	*S-0-0292*	*List of supported operation modes*
Display type	unsigned decimal	List of operation modes supported by the drive.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	-	

00296	*S-0-0296*	*Velocity feed forward gain*
Display type	unsigned decimal	Drive speed feed forward gain. **Note:** Velocity feed forward gain is effective also in mode “position control, with following error” since the corresponding drive parameter is effective regardless of the operation mode.
Decimals	2	
Writable in	CP2, CP3	
Unit	-	
Min	0	
Max	1000	
Default	-	Non-volatile

00300	*S-0-0300*	*Real-time control bit 1*
Display type	unsigned decimal	State of the real-time control bit 1 is also visible via the service channel. See *Real time bits*.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	0	

00301	*S-0-0301*	*Allocation of real-time control bit 1*
Display type	IDN	Selects the destination IDN of the Control word real-time control bit 1. See *Real time bits*.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	-	
Max	-	
Default	0	Non-volatile

00302	*S-0-0302*	*Real-time control bit 2*
Display type	unsigned decimal	State of the real-time control bit 2 is also visible via the service channel. See *Real time bits*.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	0	

00303	*S-0-0303*	*Allocation of real-time control bit 2*
Display type	IDN	Selects the destination IDN of the Control word real-time control bit 2. See *Real time bits*.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	-	
Max	-	
Default	0	Non-volatile

00304	*S-0-0304*	*Real-time status bit 1*
Display type	unsigned decimal	State of the real-time status bit 1 is also visible via the service channel. See *Real time bits*.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	0	

00305	*S-0-0305*	*Allocation of real-time status bit 1*
Display type	IDN	Selects the source IDN for the Status word real-time status bit 1. See *Real time bits*.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	-	
Max	-	
Default	0	Non-volatile

00306	*S-0-0306*	*Real-time status bit 2*
Display type	unsigned decimal	State of the real-time status bit 2 is also visible via the service channel. See *Real time bits*.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	0	

00307	*S-0-0307*	*Allocation of real-time status bit 2*
Display type	IDN	Selects the source IDN for the Status word real-time status bit 2. See *Real time bits*.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	-	
Max	-	
Default	0	Non-volatile

00330	*S-0-0330*	*Status "nfeedback = ncommand"*
Display type	unsigned decimal	|velocity command - velocity feedback| ≤ velocity window. Effective in the velocity control operation mode and if actual velocity is available from the drive. See IDN *00157*.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	0	

00331	*S-0-0331*	*Status "nfeedback = 0"*
Display type	unsigned decimal	|velocity feedback| ≤ standstill window. Effective if actual velocity is available from the drive. See IDN *00124*.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	0	

00332	*S-0-0332*	*Status "nfeedback < nx"*
Display type	unsigned decimal	|velocity feedback| ≤ velocity threshold. Effective if actual velocity is available from the drive. See IDN *00125*.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	0	

00333	*S-0-0333*	*Status "T >= Tx"*
Display type	unsigned decimal	|torque feedback| ≥ torque threshold. Effective if actual torque is available from the drive. See IDN *00126*.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	0	

00334	*S-0-0334*	*Status "T >= Tlimit"*
Display type	unsigned decimal	|torque feedback| ≥ torque limit. Effective if actual torque is available from the drive. See IDN *00092*.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	0	

00335	*S-0-0335*	*Status "ncommand > nlimit"*
Display type	unsigned decimal	|velocity command| > |velocity limit|. Effective in the velocity control operation mode. See IDN *00091*.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	0	

00336	S-0-0336	Status "In position"
Display type	unsigned decimal	|position error| ≤ position window. Effective in the position control operation mode. See IDN 00057.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	0	

00390	S-0-0390	Diagnostic number
Display type	unsigned decimal	Provides the same information as the MODULE LED when it is blinking red. Indicates the number of blinks of the red LED. See *LEDs* for the meaning of the error codes.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	0	

00400	S-0-0400	Home switch
Display type	unsigned decimal	Value for this IDN is taken from DCU Status word bit 31. Works only if the home switch digital input value is routed to DCU SW bit 31 at the drive. If any other data is routed to DCU SW bit 31, then this IDN is inoperative. For example, in the ACSM1 set par. 50.11 FBA SW B15 SRC = P.6.11 POS CORR STATUS.10.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	0	

00403	*S-0-0403*	*Position feedback value status*
Display type	unsigned decimal	Bit 0 of this IDN is '1' when the zero point of the position feedback value is the machine zero point, in other words, after a successful homing procedure. Bit 0 is '0' when procedure command IDN 00148 or 00191 is started or the drive has lost its reference to the machine zero point somehow.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	0	

00413	*S-0-0413*	*Bit number allocation of real-time control bit 1*
Display type	unsigned decimal	Selects the destination bit position for the Control word real-time control bit 1. See *Real time bits*.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	0	
Max	31	
Default	0	Non-volatile

00414	*S-0-0414*	*Bit number allocation of real-time control bit 2*
Display type	unsigned decimal	Selects the destination bit position for the Control word real-time control bit 2. See *Real time bits*.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	0	
Max	31	
Default	0	Non-volatile

00415	*S-0-0415*	*Bit number allocation of real-time status bit 1*
Display type	unsigned decimal	Selects the source bit position for the Status word real-time status bit 1. See *Real time bits*.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	0	
Max	31	
Default	0	Non-volatile
00416	*S-0-0416*	*Bit number allocation of real-time status bit 2*
Display type	unsigned decimal	Selects the source bit position for the Status word real-time status bit 2. See *Real time bits*.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	0	
Max	31	
Default	0	Non-volatile
32770	*P-0-0002*	*SERCOS drive address*
Display type	unsigned decimal	Configuration parameter group parameter 02. See the description of the drive parameter in *Drive configuration*.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	0	
Max	254	
Default	-	Non-volatile

32771	*P-0-0003*	*SERCOS bitrate*
Display type	unsigned decimal	Configuration parameter group parameter 03. See the description of the drive parameter in *Drive configuration*.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	2	
Max	16	
Default	-	Non-volatile

32772	*P-0-0004*	*SERCOS TX power*
Display type	unsigned decimal	Configuration parameter group parameter 04. See the description of the drive parameter in *Drive configuration*.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	1	
Max	4	
Default	-	Non-volatile

32773	*P-0-0005*	*Profile*
Display type	unsigned decimal	Configuration parameter group parameter 05. See the description of the drive parameter in *Drive configuration*.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	0	
Max	1	
Default	-	Non-volatile

32774	*P-0-0006*	*Drive SW sync position*
Display type	unsigned decimal	Configuration parameter group parameter 06. See the description of the drive parameter in *Drive configuration*.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	0	
Max	4	
Default	-	Non-volatile

32775	*P-0-0007*	*Cyclic high TX position*
Display type	unsigned decimal	Configuration parameter group parameter 07. See the description of the drive parameter in *Drive configuration*.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	0/1	
Min	0	
Max	1	
Default	-	Non-volatile

32776	*P-0-0008*	*CP4 transition mode*
Display type	unsigned decimal	Configuration parameter group parameter 08. See the description of the drive parameter in *Drive configuration*.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	0/1	
Min	0	
Max	1	
Default	-	Non-volatile

32788	*P-0-0020*	*ACT position time displacement*
Display type	signed decimal	Apparent time offset for position feedback values. Usable in certain conditions only, see *Appendix B – Time offset adjustment*.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	µs	
Min	-2000	
Max	32767	
Default	0	Non-volatile

32789	*P-0-0021*	*REF position time displacement*
Display type	signed decimal	Apparent time offset for position command values. Usable in certain conditions only, see *Appendix B – Time offset adjustment*.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	µs	
Min	-2000	
Max	IDN 2	
Default	0	Non-volatile

32790	*P-0-0022*	*Drive position control mode*
Display type	unsigned decimal	Configuration parameter group parameter 22. See the description of the drive parameter in *Drive configuration*.
Decimals	0	
Writable in	CP2, CP3	
Unit	-	
Min	0	
Max	1	
Default	-	Non-volatile

32798	P-0-0030	Parameter number
Display type	unsigned decimal	Drive parameter number for reading or writing drive parameters. Format: decimal xxyy = P.xx.yy. For example, value 5101 means drive par. 51.01. See IDN *32801* and IDN *32802*.
Decimals	2	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	101	
Max	9999	
Default	0	

32799	P-0-0031	Drive parameter value
Display type	unsigned decimal	Data value which was read from the drive or value to be written to the drive. See IDN *32801* and IDN *32802*.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	-	
Max	-	
Default	0	

32800	P-0-0032	Drive parameter data type
Display type	unsigned decimal	Data type code of the last drive parameter read or written by procedure command IDN *32801* or IDN *32802*.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	0	

32801	*P-0-0033*	*Read drive parameter*
Display type	unsigned decimal	Procedure command for reading drive parameters. Parameter to be read is specified by IDN *32798*. After reading, the parameter value is placed into IDN *32799* and its data type code is placed into IDN *32800*.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	-	
Max	-	
Default	-	

32802	*P-0-0034*	*Write drive parameter*
Display type	unsigned decimal	Procedure command for writing drive parameters. Parameter to be written is specified by IDN *32798* and data is taken from IDN *32799*. After writing, the data type code of the parameter is placed into IDN *32800*.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	-	
Max	-	
Default	-	

32868	*P-0-0100*	*Last drive fault code*
Display type	hex	Last fault code read from the drive. See the drive manual for explanation of the fault codes.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	0	

32869	*P-0-0101*	*DCU CW*
Display type	hex	Drive native Control word. Do not write this IDN unless the transparent profile is selected.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	-	
Max	-	
Default	0	

32870	*P-0-0102*	*DCU REF1*
Display type	hex	Drive native reference value 1. Do not write this IDN unless the transparent profile is selected.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	-	
Max	-	
Default	0	

32871	*P-0-0103*	*DCU REF2*
Display type	hex	Drive native reference value 2. Do not write this IDN unless the transparent profile is selected.
Decimals	0	
Writable in	CP2, CP3, CP4	
Unit	-	
Min	-	
Max	-	
Default	0	

32872	*P-0-0104*	*DCU SW*
Display type	hex	Drive native Status word.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	0	

32873	*P-0-0105*	*DCU ACT1*
Display type	hex	Drive native actual value 1.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	0	

32874	*P-0-0106*	*DCU ACT2*
Display type	hex	Drive native actual value 2.
Decimals	0	
Writable in	-	
Unit	-	
Min	-	
Max	-	
Default	0	

32868	*P-0-0200*	*Nominal torque*
Display type	unsigned decimal	Drive nominal torque value that corresponds to 100% torque. Scale is 10^{-3} Nm, eg, value 1300 = 1.3 Nm.
Decimals	3	
Writable in	-	
Unit	Nm	
Min	-	
Max	-	
Default	-	

IDN value storage

The IDNs marked as non-volatile can be saved into the non-volatile memory of the adapter module, or alternatively, some IDNs' values can be kept in the drive parameters. The procedure command IDN 00264 Backup working memory procedure command saves all the non-volatile IDNs. Note that the drive may save its parameters automatically, independently of the adapter module, and thus the IDNs whose values are kept in the drive parameters may be saved even if IDN 00264 has not been invoked. IDNs saved in the adapter module can be removed by parameter *09 ERASE FBA CONFIG* but this does not affect the IDNs which are kept in the drive parameters.

IDNs saved in the flash memory

The IDNs whose values are saved into the flash memory of the adapter module are listed in the table below.

IDN	Name
S-0-0033	Secondary operation mode 1
S-0-0034	Secondary operation mode 2
S-0-0035	Secondary operation mode 3
S-0-0043	Velocity polarity parameter
S-0-0044	Velocity data scaling type
S-0-0046	Velocity data scaling exponent
S-0-0049	Positive position limit value
S-0-0050	Negative position limit value
S-0-0052	Reference distance 1
S-0-0055	Position polarity parameter
S-0-0057	Position window
S-0-0078	Linear position data scaling exponent
S-0-0085	Torque polarity parameter
S-0-0086	Torque/force data scaling type
S-0-0094	Torque/force data scaling exponent
S-0-0097	Mask class 2 diagnostic
S-0-0098	Mask class 3 diagnostic
S-0-0103	Modulo value
S-0-0123	Feed constant
S-0-0124	Standstill window
S-0-0125	Velocity threshold (nx)
S-0-0126	Torque threshold (Tx)
S-0-0142	Application type
S-0-0157	Velocity window
S-0-0159	Monitoring window
S-0-0160	Acceleration data scaling type

IDN	Name
S-0-0162	Acceleration data scaling exponent
S-0-0206	Drive on delay time
S-0-0301	Allocation of real-time control bit 1
S-0-0303	Allocation of real-time control bit 2
S-0-0305	Allocation of real-time status bit 1
S-0-0307	Allocation of real-time status bit 2
S-0-0413	Bit number allocation of real-time control bit 1
S-0-0414	Bit number allocation of real-time control bit 2
S-0-0415	Bit number allocation of real-time status bit 1
S-0-0416	Bit number allocation of real-time status bit 2

IDNs that affect ACSM1 parameters

The IDNs that affect ACSM1 drive parameters and vice versa are listed in the table below. The table does not include ACSM1 group 51 parameters, see section *FSEA-21 configuration parameters – group A (group 1)* for these parameters.

Warning! Do not change any of the drive parameters which affect IDN values via a PC tool, a panel or by IDN P-0-0034 (32802) when the sercos ring is in CP4. After you have changed drive parameters, use parameter 51.27 FBA PAR REFRESH to read the new settings into the adapter module. Failure to comply may cause incorrect operation, such as an improper control response.

IDN	Name	ACSM1 parameter
S-0-0041	Homing velocity	62.07 HOMING SPEEDREF
S-0-0042	Homing acceleration	*(ACSM1 fw. versions ≤ **UMFI151x**)* 65.06 PROF ACC 1 65.07 PROF DEC 1
		*(ACSM1 fw. versions > **UMFI151x**)* 62.27 HOMING ACC 62.28 HOMING DEC
S-0-0076	Position data scaling type	60.02 POS AXIS MODE
S-0-0091	Bipolar velocity limit value	20.01 MAXIMUM SPEED 20.02 MINIMUM SPEED
S-0-0092	Bipolar torque limit value	20.06 MAXIMUM TORQUE 20.07 MINIMUM TORQUE
S-0-0100	Velocity loop proportional gain	28.02 PROPORT GAIN
S-0-0101	Velocity loop integral action time	28.03 INTEGRATION TIME

IDN	Name	ACSM1 parameter
S-0-0104	Position loop KV-factor	71.03 POS CTRL GAIN
S-0-0116	Resolution of feedback 1	93.01 TTL1 PULSE NR
S-0-0121	Input revolutions of load gear	71.07 GEAR RATIO MUL
S-0-0122	Output revolutions of load gear	71.08 GEAR RATIO DIV
S-0-0138	Bipolar acceleration limit value	70.05 POS ACCEL LIM 70.06 POS DECEL LIM
S-0-0147	Homing parameter	62.01 HOMING METHOD
S-0-0207	Drive off delay time	22.06 ZERO SPEED DELAY
S-0-0296	Velocity feed forward gain	71.04 P CTRL FEED GAIN
P-0-0200	Nominal torque	98.01 TORQ NOM SCALE

Further information

Product and service inquiries

Address any inquiries about the product to your local ABB representative, quoting the type designation and serial number of the unit in question. A listing of ABB sales, support and service contacts can be found by navigating to www.abb.com/searchchannels.

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3AUA0000068941 Rev B (EN) 2013-11-19

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